CONTRIBUTIONS

TO THE

PATHOLOGY OF CHOLERA,

EMBRACING ITS

HISTORY, MODIFICATIONS, STAGES,
AND TREATMENT,

AS THE DISEASE APPEARED IN THE BOMBAY PRESIDENCY,
FROM 1818 TO 1842.

BY

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TO THE

Chairman, Deputy-Chairman, and Court of Directors

OF THE

HONOURABLE EAST INDIA COMPANY,

THIS SUMMARY

OF ALL THAT IS NOW KNOWN OF A SEVERE MALADY
AFFLICTING SO FREQUENTLY THE MILLIONS
OF OUR

EASTERN EMPIRE,

IS RESPECTFULLY DEDICATED,

BY THEIR MOST OBEDIENT SERVANT,

JAMES BIRD.

PREFACE.

THE first portion of the following observations on CHOLERA, was written for the *London Journal of Medicine*, at a time when public alarm, for the expected ADVENT of the disease, had begun to subside; and it was more an object, with the author, to investigate what accumulative Indian and European experience had taught him, relative to the PATHOLOGY and TREATMENT of an obscure malady, than to court notoriety for the originality of his opinions, or speciality of his therapeutics. The lapse, since then, of nearly five months, has only been accompanied by the onward march of Cholera, and a progressive increase of mortality, notwithstanding the extended application of sanitary measures, and the exaggerated expectations of benefit from them. But as the various specifics, proposed for the treatment of this disease, have, from day to day, been used more and more empirically, and without that foundation in intelligible therapeutic principles, deemed necessary for other ills that flesh is heir to, it is time for us to inquire, whether the rational system of medicine, founded on a knowledge of morbid alterations of structure, and chemical change of fluids, be not more necessary to secure success in treating Cholera, than the examples even of other complicated diseases. The author's own experience on this head, coincides with the well-weighed opinion of Professor Andrew Buchanan, of Glasgow; that "there is no disease which admits less of being treated *empirically*, than Cholera." A lucid arrangement of the symptoms, which indicate its modifications and stages, viewed in relation to ascertained morbid changes of both the animal solids and fluids, and the known physiological laws of their vitality, seems to hold out the only ground of hope left us to secure a better knowledge of the disease, and a more rational system of treatment. And should the author but succeed in directing the attention of his professional brethren to this main object of research, so as to render the treatment of CHOLERA more definite and less empirical, he will have attained all he could hope for or desire.

The disease, as he has endeavoured to show, from the experience of the past, even in India, is of *endemico-epidemic* origin; and proceeds from many concurrent causes and conditions, which alter the chemical constitution of the blood, and render it incapable of receiving those respiratory changes in the lungs, necessary for the production of animal heat and the maintenance of the nervous functions. These causes and conditions may be briefly enumerated, as deficient and impure food; sleeping in crowded, damp, and ill-ventilated apartments; anœmia, or impoverished conditions of the blood, arising from previous disease, dissipation, and want; deleterious influence of malarious emanations and animal effluvia; close, humid, and negatively electric conditions of the air; mental anxiety and depression; and a general epidemic constitution of the atmosphere. But while the disease originates from these several causes, it manifests, in its progress from place to place, that it can attach itself to masses of the people, and can, under certain conditions, be disseminated from person to person.

The accumulated experience of the highly intelligent medical officers of our INDIAN ARMY, on the treatment of Cholera, at the several Presidencies, and all facts obtained of late years, regarding its *endemic* and *epidemic* outbreak, will, it is hoped, be called for by the Honourable Court of East India Directors, and be made available for public information, and the elucidation of a most obscure and fatal disease.

London, 27, *Hyde Park Square*,
August 26*th*, 1849.

CONTRIBUTIONS TO THE PATHOLOGY AND TREATMENT OF CHOLERA.

INTRODUCTORY REMARKS.

In my previous contributions to The London Journal of Medicine, on the Pathology and Treatment of Tropical Fevers, the relation between the algide stage of their intermitting and remitting forms, and that of Cholera, was briefly noticed. The analogy of the phenomena accompanying the reaction and hot stages of these fevers, with the febrile or consecutive stage of Cholera, was also brought under consideration, and stated to be referable to an increased flow of blood through the spinal marrow and its dependent nerves, similar to that which seems to be associated with the symptoms of the hot stage in both diseases. The extraordinary general similarity also of symptoms, which characterize the different stages of Cholera, to those attending certain modifications of fever, could scarcely pass unobserved by any one who had opportunity, within the tropics, of becoming familiar with such affections; nor could the striking fact remain unheeded, that attacks of endemic Cholera happened, like intermittents, most commonly at the changes of the moon, and prevailed, along with these fevers, in the same locality. Such manifest resemblances could not fail in impressing the mind with a belief, that if the relation of these diseases be not constant, it at least arises from the same external atmospheric influences which change the human organism from a state of health to disease. So forcibly had facts brought this conviction to my mind, that in my Cholera reports, on the disease at Kaira, in 1819, addressed to Dr. S. Meek, then superintending surgeon of the Gujerat division, I pointed out the apparently intimate connexion of the two; stating, that several cases had come under my observation, where Cholera and intermittent fever alternated with each other. In 1820, when again reporting to Dr. Jukes, I brought to his notice, that the greater number of Cholera attacks among the prisoners in the jail of Kaira, happened at the lunar periods; and how, in the middle of April of that year, the *karkoon*, or native revenue writer, of the town of Neriad, in the province of Gujerat, had reported, that for three or four days, about the period of the new moon, thirty or forty people were attacked daily by Cholera, and that, soon after, the number of attacks decreased to six or seven. In subsequent annual reports to medical authorities in India, particularly those of the European General Hospital, for the years 1838-39, I had occasion to repeat the same observations and opinion; and am now only anxious to record my having done so, as Dr. Chambers, in two admirable and luminous lectures on Cholera, delivered to the students at St. George's Hospital, and lately published in the *Lancet*, has proved with great ability the existence of a disease, prevalent in London about 1680, and the following years, identical with the Asiatic malady; and which had a common origin with epidemic febrile diseases, and others of an intermittent type, arising from miasmata, and ordinarily affecting the inhabitants of this city. The delineations of this disease, quoted by Dr. Chambers, are found in Dr. Morton's *Treatise on Fevers;* and both these, and the descriptions of Cholera, by medical authors of antiquity, must satisfy us of the truth, that the so-called Asiatic Cholera, which has of late years prevailed in Europe, was long previously known to practical observers, and cannot be dated as a new disease from the reputed epoch of its birth in 1817. More modern writers in India, as Paisley, Girdlestone, and Curtis, have recorded the prevalence of this disease, which broke out with great severity in 1695, while Aurangzeb's army was besieging Beejapoore. The Persian author, who records the circumstances as an eye-witness, states, "that amidst the calamities of a famine, which afflicted the country the previous year, a pestilential fever and diarrhœa attacked the people in camp; and by little and little spread through the whole with such fatality, that no one calculated on his existence for a single hour, and the bazaar transactions were only carried on for ready money."

But if both diseases appear so closely connected in their origin, they are not less intimately related to one another by their phenomena during life, than by their post-mortem appearances. Cholera, like fever, is not exclusively a disease of either the vascular or nervous system; and if the post-mortem vascular appearances of particular organs be not identical in both, they seem only to differ in degree. Those of Cholera are what we might expect to find in algide intermittent, terminating fatally soon after the accession of the cold stage, had we opportunities of tracing them; but those of fever are more of secondary result, following the reaction of the central vascular organs to remove injuries of the peripheral ones, by abnormal self-excitation of the blood, for the purpose of depuration, and restoration of the circulating fluid to health. It is only by viewing Cholera as allied to fever in its modifications, and progressive like it in its forms, that any well-founded arrangement of symptoms can be made, or any rational method of treatment laid down, as applicable to its different stages. Such is the object of this paper; and without speculating on the origin and sources of the disease, I shall endeavour, for the present, to specify its modifications, and the most suitable system of treatment, founded on my own experience, and on that of others.

The following observations may be arranged under five heads, viz.—

I. History of the disease, as observed at various times and places since 1818. II. Modifications; symptoms and stages considered collectively. III. Particular symptoms originating in the perverted functional action of individual organs. IV. Post-mortem appearances and pathology. V. Treatment.

I. HISTORY OF THE DISEASE.

On my arrival at Bombay, the 2nd of August 1818, I was directed to do duty in the garrison of Tannah, under the then garrison-surgeon, Dr. Jukes, whose excellent letter, descriptive of the Cholera as it appeared at that station, will be found in the well known Bombay Reports. I joined the garrison (then consisting of a wing of H.M. 89th, and of other European and native detachments), immediately after the advent there of the disease, on the 13th of August. It had travelled along the high-road of the Dekhan, from Nagpoor, Jaulnah, Aurungabad, Ahmednagar, Seroor, and Poona, to Panwell—a considerable village on the mainland, separated from Bombay by an arm of the sea. Between the latter and Bombay there is a constant communication, by means of boats, or by the more circuitous overland route of Tannah. On the 6th of August the disease broke out with great violence at Panwell; appeared at Bombay on the 9th or 10th; and at Tannah the 13th of the same month. Here, a naique, who had escorted the state prisoner Trimbuckjee Danglia from Seroor, was the first person attacked. By the 16th of the month, the disease at Tannah had become general, and as many as fifty or sixty deaths among the natives of the bazaar were reported daily. The epidemic continued to prevail both among Europeans and natives, and with greater or less violence, till the 19th of September, when it began to decline. From the time of its commencement to its disappearance, I carefully kept notes of the principal cases admitted into the hospital, or occurring among the natives of the bazaar and servants of the civil establishments; the modifications of the disease, the apparent utility or otherwise of remedies, and any peculiarity of symptoms, being in this manner minutely recorded. In the absence of such records, and of the leading characters of Cholera cases, whether of endemic or epidemic origin, we can seldom draw any accurate conclusions as to what may be the contingent, and what the constant conditions of the disease. Certainly, some of the peculiarities of the Cholera attacks then noted have not since come under my observation; and such differences may account for the greater utility of blood-letting at that time, and the greater confidence reposed in it as a remedy, either in India or in this country. These peculiarities and modifications of the epidemic Cholera of 1818, not being mentioned in Dr. Jukes' report, I will endeavour here briefly to detail them.

Most descriptions of the disease, as it appeared at that period, too exclusively appertain to its collapsed stage, when the blood and lungs have ceased to generate animal heat, and the powers of the secretory organs have almost completely failed. But before the occurrence of symptoms characterizing this well-marked period of the disease, there were premonitory ones of diarrhœa, with nervous depression and fits of transient excitement, accompanied by acute burning pain at the scrobiculus cordis, a frequent irritable pulse, and somewhat augmented heat of skin. The first onset of the disease appeared both among Europeans and natives; and the blood drawn from either at this period, frequently threw up a thin sizy film. If nothing was done to arrest the progress of the attack, the burning paroxysmal pain at the stomach increased, and was followed by vomiting of white-coloured fluid; the diarrhœa became more urgent, and the alvine evacuations changed from a dirty yellow colour to that of rice-water; the skin was cold, and covered with clammy perspiration; the pulse became more labouring and oppressed, accompanied by much vertigo, distressing languor, and craving thirst: the whole phenomena of this stage bearing a marked resemblance to those of congestive or asthenic remittent. Though the skin of many patients was cold and clammy to the touch, they nevertheless complained of being tormented with burning heat, and were affected by spasms of the extremities.

After these symptoms had existed for some time, without any appearance of reaction in the system, the pain at the scrobiculus cordis for the most part abated, or entirely ceased; the respiration became more oppressed; the arterial action more feeble; the skin corrugated and shrivelled; the eyes sunk in their sockets; the voice more feeble and scarcely audible; till at last, increasing coma and death terminated the patient's suffering. Such was the general mode of attack, and progress of the disease. Sometimes, however, the vomiting and pain at the pit of the stomach were the earliest symptoms, and were present for an hour or two before the purging commenced; at other times, both vomiting and purging occurred without vertigo; and occasionally there was no pain of stomach complained of, unless when pressed by the hand, which created an inclination to vomit. The discharges from the stomach and bowels varied in appearance, being sometimes clear and serous; and at others, white and mucaginous, like rice-water. For the most part, the pulse was frequent, feeble, and irregular; but occasionally, it was excited and compressible, as in fever; and whenever this happened, there was less apparent determination to the head than usual. Total deafness was only present in one instance; and in another, the patient complained of a noise in his ears resembling rushing water. There were other symptoms which accompanied the several attacks, and which will be more fully enumerated when I come to consider the modifications and stages of the disease.

Such was its usual progress; but most of the patients were not brought for medical aid, until the stages of congestion and collapse had been fully developed. Generally, these stages ran their course progressively, and were sufficiently well marked; but sometimes, the earlier one of nervous depression was wanting, or so rapid in its transition to congestion and collapse, that its development was scarcely manifest ere it had passed into the final coma of the others. This form of Cholera has been not inappropriately named ganglionic apoplexy, being characterized by the following manner of attack. After some languor, and a little watery purging, having been present for six, eight, or more hours, the person attacked complains of severe burning pain at the pit of the stomach, accompanied by vertigo, and soon after falls down insensible; his respiration being feeble, his pulse oppressed, his skin more or less cold, and his jaws spasmodically closed, though not so rigidly as to prevent their being opened by gentle force. This will be best illustrated by the following case. On the 26th of August, one of the revenue collector's peons went from his duty to dinner in apparently good health, excepting that in the morning he had been suffering from flatulency and pain at the stomach. While in the act of eating, he was seized with vertigo, and soon after fell down senseless, in which state he was carried to the house of the collector, where some ether and brandy were given to him. Dr. Jukes soon after saw him, and found his skin below the natural warmth, his respiration almost suspended, and his eyes fixed. A vein was opened in the left arm, which bled rather languidly; but as the vital action of the heart became a little renovated, another vein was opened in the right arm, from which the blood began to flow with considerable force. Soon after, the patient made several deep inspirations, his eyes regained their natural motion, and all the other organs seemed to resume their functions. About thirty ounces of blood were abstracted, fifteen grains of calomel were administered, and bottles of hot water applied to the feet and stomach. A copious perspiration speedily followed, and next day the patient was nearly well.

During the cold months, from the end of 1818 to that of February 1819, the Cholera disappeared, and little or no mention of it is made in the hospital reports. By this time, I had been removed from Tannah to Kaira, in Gujerat, and directed to do duty with a native regiment, the 2nd battalion 7th regiment of infantry. In the end of April, some sipahies belonging to a detachment of this regiment, stationed at Dubassa, were sent to the head-quarters at Kaira, where, soon after their arrival, several cases appeared, on the 4th of May, among the men of the regiment. At the same time, the men of the pioneer corps, stationed in the lines at Ruttenpoor, and in the immediate vicinity of the dragoon cantonment, were attacked by the disease, without having had any communication with the affected sipahies from Dubassa. The cases admitted were of a highly congestive character, running rapidly into fatal collapse, which seldom admitted of the abstraction of blood from the veins, even when the patients were in the hottest bath that could be borne; so that if a small quantity of blood were obtainable in this manner, it only hastened the fatal result. Opiates also seemed to increase the desire to sleep, and tendency to collapse. Nearly two-thirds of the cases admitted proved fatal: and many of them within five hours from the period of the attack. In all the severer cases there was a remarkable absence of the paroxysmal pain at the scrobiculus cordis, which distinguished the Cholera attacks of 1818. Most of the deaths happened among the pioneers, who not only occupied an unfavourable locality on the dragoon side of the river, but were greatly predisposed to Cholera affection, by the contingent causes of poor living and mental depression. The supernumeraries of the pioneer corps, to whom the urgency of military service in Cutch had given temporary employment during the cold weather, were brought down to Kaira for discharge, and were those who suffered most. They had no huts to shield them from the weather, and were continually exposed to the heat of the sun by day, and to the land wind by night. They were, with very few exceptions, Hindoos; who, from their abstemious and even penurious habits, are well known to live on the cheapest food, of inferior nutritious qualities. Such habits, by predisposing the body to the unhealthy influences of other exterior conditions, particularly cold bathing after hard work, and in an excited state of the cuticular capillaries, seem to have borne no inconsiderable share in producing a disease of great malignity. The disease continued to prevail at Kaira, and in many of the neighbouring towns, throughout the hot weather, and disappeared, for a time, after the setting in of the rainy season in the middle of June.

In the succeeding year, 1820, it reappeared about the beginning of March, after having been prevalent for some time in the neighbouring villages of Nereiad, Mahmudabad, and Mandwa. The disease had travelled, as would appear, from Surat to Baroda, and thence to Kaira; having broken out at the former place some time about the end of December 1819, or beginning of January 1820. It made its first appearance there in Chilli Bey's dock-ship, and in the native lines, where the 2nd battalion 3rd regiment of native infantry was then stationed; attacked the men of this battalion, and prevailed also among the prisoners in jail. This regiment, soon after the appearance of the disease in Surat, marched for Baroda, and was severely attacked by it at the second halting-ground. It continued to affect the men of the battalion, but in a milder degree, along the whole line of march, and afflicted them more severely on their arrival at Baroda, where between fifty and sixty died out of a hundred cases. Some account of its prevalence at this station may be found in Dr. Kennedy's work on Cholera. It did not finally cease to prevail in the 3rd native infantry, till the regiment marched from the station and joined Colonel Barclay's force, then employed on the banks of the Run, where not a case occurred during all the hot weather, though the troops were kept constantly marching. On the 3rd native infantry going into Bhooj, in Cutch, about the middle of June, while the Cholera was raging there, it again severely suffered from the disease, which carried off Mr. Colegate, the assistant-surgeon of the regiment.

From this time, Cholera continued prevalent, at short intervals, in different parts of India; but as I had no opportunity of seeing any great number of cases till 1838, I kept no notes on the subject. While employed at this time, as surgeon of the European General Hospital, at Bombay, I admitted twelve cases of the disease in the months of July and November. Three of these proved fatal. All the attacks in July commenced with diarrhœa; which, after continuing several days, was followed by vomiting, coldness of the skin, collapse of countenance, and sinking of the circulation, as marked by a frequent feeble pulse. The gastro-enteritic affections seemed to be only modifications of the same disease; being characterized by pain at the epigastrium, diarrhœa, and sometimes vomiting, accompanied by a feeble pulse and vertigo, which increased as the purging diminished. The Cholera admissions for November happened at the time of the new moon; when the dew was falling, and the weather had become cold. Some cases of intermittent fever occurred at the same time. The sister of one of the Cholera patients who died, had irregular febrile symptoms; and the mother of both these, on being attacked by Cholera, also died in the beginning of the next month.

In 1839, thirty-three cases of Cholera were admitted, fifteen of which proved fatal, being 45·4 per cent. of deaths. The greater number of casualties happened during May; Cholera at this time being prevalent amongst the seamen of the ships in harbour. The men attacked on shipboard were generally sent to hospital in the last stage of the disease, and under most disadvantageous circumstances; having been exposed during the day to the influence of a burning sun, and at night to the land wind. Many of the admissions were of children born in the country, who had lost all pulse, and were in the last stage of collapse. Some of the successful cases were of the bilious kind, or of "hepatic erethism", marked by epigastric tenderness, and cramp of the abdominal muscles. The two diseases, "Bilious Cholera" and "Algide Cholera", are the same morbid states, differing only in degree: the former consisting of ganglionic irritation, and increased hepatic secretion, as the consequence of imperfect decarbonization of the blood; the latter of ganglionic and cerebro-spinal congestion, with endosmotic sero-mucous exhalation from the intestines, the result of impaired vitality of the blood.

About the middle of March 1840, the disease reappeared at Bombay, prevailed among the inhabitants generally, and affected the men of H.M. 6th regiment, stationed at Colaba; several of whom were attacked, while on guard in the fort, and were admitted into the General Hospital. During the succeeding months of April and May, cases of Cholera, of a bilious, spasmodic, and collapsed form, were received into hospital; the chief peculiarities of which were the long continuance of the vomiting and purging, accompanied by gradually decreasing energy in the circulating system and vital powers, before the complete development of the collapsed stage, which always terminated fatally. The treatment of such cases consisted chiefly of acetate of lead and opium, administered in the proportion of a grain and a half of the former, to the twelfth of a grain of the latter, with sinapisms to the epigastrium, weak brandy and water, or thin sago and wine for drink, with enemeta. In spite of this treatment, however, the disease, from its first appearance, with vomiting or purging of rice-water-like fluid, progressed slowly to the more complete development of the other symptoms of *algide Cholera*, as if the depressing effects of the diarrhœa, which supervened on the functional lesion of the blood, had caused the gradual loss of nervous energy, and of those chemical changes in the system requisite

TABLE I.—NUMBER OF PERSONS ATTACKED BY CHOLERA, AND OF THOSE RECOVERED AND DECEASED, WITH AND WITHOUT RECEIVING AID OF MEDICINE.

No.	Names of the Talooks.	Population.	Period the disease continued.	No. of persons attacked	Received aid of medicine.			Received no aid of medicine.			Number attacked.			Remarks.
					Rec.	Died	Totl.	Recov.	Died.	Total.	Recov.	Died.	Total.	
1	Sumpgaon	59,329	April to Sept.	1,362	35	26	61	386	915	1,301	421	941	1,362	The disease commenced in Wuckoond, E. of Sumpgaon, and amongst travellers from Kulludghee.
2	Beedee	82,164	April to July	702	7	8	15	201	486	687	208	494	702	The disease commenced in Nichundee, E. of Beedee, and amongst the people who returned from the Jatra at Yellama.
3	Padshapoor	46,711	Jan. to Aug.	522	93	94	187	79	256	335	172	350	522	This disease spread into this Talooka, from the people who returned from the Jatra at Yellama and Kadar Lingdeo.
4	Chickoree	75,064	April to June	1,282	33	68	101	323	858	1,181	356	926	1,282	The people who went to the Jatra of Kadar Lingdeo, brought the disease into this Talooka.
5	Bagulkote	53,407	April to July	2,715	15	21	36	744	1,935	2,679	759	1,956	2,715	The disease commenced at Hippergee Zillah Kolapoor. At Kolapoor the disease first made its appearance in May 1841.
6	Badamee	56,639	April to July	1,557	48	79	127	336	1,094	1,430	484	1,173	1,557	The villagers of Mootulgherree went southward in search of labour; on their return they were attacked by the disease.
7	Uthnee	33,821	Mar. to June	1,816	102	130	232	534	1,050	1,584	636	1,180	1,816	The disease first broke out in Kabundkee, E. of Uthnee, and spread into the whole Talooka. In Uthnee alone, 681 persons were seized with Cholera during April.
8	Gokak	48,310	April to June	1,306	27	73	100	288	918	1,206	315	991	1,306	Disease broke out amongst the villagers of Chicknundee, from thence it spread into the Talooka. At Kolapoor about 1000 persons died in three weeks in April and May.
9	Pursghur	45,534	April to Sept.	900	46	65	111	204	585	789	250	650	900	The villagers of Bailsoor were first attacked; from thence it spread into the Talooka.
10	Hoongoond	50,649	May to June	827	0	5	5	241	581	822	241	586	827	The villagers of Somlapoor and Koodeehall were first attacked.
	Total	551,628		12,989	406	569	975	3,336	8,678	12,014	3,742	9,247	12,989	

Belgaum, 31st December, 1812.

for the production of animal heat. In many of these cases, the symptoms of progressive loss of vital power were present for a period of two or more days, before the patient became powerless, and the secretory functions terminated in fatal collapse.

I had no further opportunity of observing cases of Cholera, or of ascertaining the progress of the disease, till my removal from Bombay to Belgaum, as superintending-surgeon of the southern division. The troops serving in this division belonged to the Madras presidency; and almost every regiment which, during the years 1841 and 1842, had occasion to change stations, and to march along the extensive plain of deep black alluvial soil, from Kolapoor northwards to Bellary southwards, experienced severe loss in its ranks and among its followers, from Cholera, which was extensively prevalent, during these years, among the villages and in the districts included in the collectorates of Kolapoor, Belgaum, and Dharwar.

In the beginning of the former year, it broke out among the pilgrims assembled at Kolapoor, to celebrate the religious festival of "Kadar Ling-deo"; and from them spread, in February and March, into the neighbouring districts of Padshapoor, Uthnee, and Gokauk; having soon after become general in the collectorates already mentioned. In May 1841, the disease appeared with great severity at Sholapoor, among the troopers of the 5th Madras cavalry; the medical officer of the regiment deeming that its outbreak was, in part, connected with the filthiness and ill-ventilated state of the native huts in the cavalry lines. The progress of the disease indeed may have been connected with these causes; but long before its appearance in the lines at Sholapoor, it had been prevalent in the villages of the neighbouring districts, manifesting, in its progress from place to place, that it attaches itself to masses of the people assembled for the purpose of celebrating religious festivals, and can in this way be disseminated from person to person.

Whoever will take the trouble of investigating the information on this point, embodied in Table I (*see previous page*), and will, by referring to a map of the country, trace the outbreak of the disease, and its progress from place to place, must, I think, be convinced of this fact, that Cholera of endemic origin, under a community of habits, and of atmospheric conditions, can become transmissible from locality to locality, and from the sick to the healthy, who breathe the same atmosphere in ill-ventilated apartments. Such is the fact, however, and one practically known in India, that, whenever a native regiment, attacked by Cholera on the march, is allowed, immediately after arrival at a new station, to occupy the regimental lines of native huts, its men and followers continue to suffer for a long time from the disease. It is therefore usual to encamp the infected regiment outside the cantonment, in some dry and healthy locality; and not to allow the men to occupy their huts till all traces of the disease have disappeared. Such precautions are, I think, attended with the best possible results in preventing the spread of Cholera: and even where encampments of men have been attacked by it on the deep black alluvial soil, a change of position to the hard, dry, and ferruginous laterite formation, in the immediate neighbourhood, appeared to be followed by equally happy results.

The Cholera was again prevalent in 1842, and raged at the same time in Bombay, as may be seen by reference to Table II. It increased gradually from the beginning of the year till the hot, humid months of May and June, when the disease reached its climax. The influence of a moist and hot atmosphere in diminishing the cutaneous exhalation, and increasing the absorbent function of the skin, seems favourable to the operation of malarious causes; to which, and the negatively electric state of the atmosphere, many of the endemic attacks of Cholera, which annually occur in these months, are clearly traceable. It was in this same year, I think, that the 23rd Madras native infantry, on its march to Dharwar, was severely attacked by the disease on the banks of the Toombhoodra river, and lost several of its European officers. But enough has been already related relative to the history of the disease, and in illustration of the circumstances and conditions of the *endemico-epidemic* causes, which render it prevalent.

TABLE II.—Statement showing the number of persons reported to have died of Cholera, and of those who received Government medicines, with the result, in the island of Bombay (estimated population, 235,000), from 7th February to 31st December 1842.

Months.	Recovered.	Died	Result unknown.	Total.	Total reported to have died.
February	—	—	—	—	2
March	—	—	—	—	100
April	—	—	—	—	142
May	—	—	—	—	2,391
June	—	—	—	—	851
July	—	—	—	—	292
August	—	—	—	—	283
September	—	—	—	—	265
October	—	—	—	—	128
November	547	161	—	708	710
December	2,144	390	27	2,561	912
Total..	2,691	551	27	3,269	6,106

II. MODIFICATIONS, STAGES, AND SYMPTOMS, CONSIDERED COLLECTIVELY.

Some writers on Cholera would establish a difference between cases of *endemic* and *epidemic* origin; distinguishing varieties of serous diarrhœa, attended by depression of nervous energy, feebleness of the circulation, and low animal heat, as forms of *pseudo-Cholera.* There is no foundation, however, for this distinction; cases of diarrhœal Cholera, caused by functional blood lesions, may be converted by neglect, or the employment of purgatives, into well-marked attacks of Cholera. In such, as I shall clinically illustrate, languor, lassitude, nausea, and diarrhœa, accompanied by alternating chills and heats, may precede, even for several days, the appearance of purely serous, rice-water-like stools, and the *algide stage.* During the epidemic of 1818, I frequently witnessed cases of this kind, and have good ground for belief, derived from personal observation, that between these and the endemic Cholera attacks, prevalent annually in India just before the commencement of the rainy season, and those which have proved so fearfully fatal to regiments and their followers, while marching through the southern Mahratta country, there is no real difference. The action of the causes producing them may differ in intensity; but the morbid changes effected in the constitution by their agency are the same.

General description of Cholera. The invasion of Cholera is sometimes slow and insidious; sometimes, it is sudden and rapid in its progress, overpowering the vital functions, as if the person affected had been struck down by lightning or apoplexy. The first is the more common mode of attack when the disease proceeds, as would appear, from *endemic* malarious causes, or impure and deficient food; the latter is the more frequent occurrence when it is produced by *epidemic* atmospheric conditions of great intensity. Premonitory diarrhœal symptoms, the indications of incipient abnormal changes in the blood, usually give warning of the first kind of attack, while little or no purging precedes the vertigo, oppressed respiration, syncope, and interrupted pulse, by which the last is characterized. Some symptoms of depression, or at least of disturbance in the nervous system, usually usher in each form of attack. The patient is sleepless, complains of languor, lassitude, and listlessness, and has indescribable sensations of oppression at the chest. These are succeeded by an expression of anxiety in the countenance, pallor of the cheeks and lips, coldness of the hands and feet, nausea, and burning pain at the pit of the stomach; to which supervene vomiting, purging, and occasional tenesmus. The pulse is found, on examination, to be enerally, frequent, small, and irregular · and sometimes very slow

There is extreme constriction at the præcordia; the thirst is intense and painful; the tongue, moist and cold; and there are occasional *clonic* spasms of the muscles of the abdomen and legs. Sometimes the coldness of the cutaneous surface, when the disease is slow in its progress, is followed by partial dry heat of skin, and accompanied by a sharp, rapid, and compressible pulse. With the continuance of the diarrhœa, these symptoms progressively pass into collapse; though the more usual occurrence is to find the disease progressing rapidly to collapse, without any indication of reaction in the circulating system. Where this is the case, the tormina and thirst are exasperated; the vomiting and purging increase; the eyes are deeply sunk in their orbits; the countenance becomes shrivelled and Hippocratic; the skin of the hands and feet corrugated; the forehead is covered by profuse cold sweat; the vomiting, purging, and spasms, cease; the heart is feeble and fluttering in its action; the pulse almost imperceptible; the respiration frequent and oppressed; and the patient gets more and more exhausted, tossing about the bed in a constant state of restlessness; till at length coma, stertorous breathing, and the struggles of death, close the scene.

Modifications of the Disease. All the varieties I have ever seen of this extraordinary malady, may, I think, be comprehended under the *Diarrhœal*, *Pyrexial*, and *Asphyxial* forms.

1. *Diarrhœal Modification.* In this form, the causes producing Cholera appear to have had only partial effect; and to require the contingent conditions of time and circumstances to complete those changes of the blood, which constitute the complete development of the disease. Epidemic and endemic cases of this kind are frequently met with, and will be best illustrated by examples.

Case i. James Copper, a corporal in the Grand Arsenal, aged 39 years, emaciated and feeble—states (on admission into hospital, March 14th, 1840), that, for the last three or four days, he has had frequent purging with vomiting, which increased last night. Pulse feeble; skin dry; tongue expanded and white; epigastrium tender on pressure, and somewhat full. Four grains of calomel, with aromatic confection, and a grain and a half of opium, were given on his admission in the morning, and followed by four dozen of leeches to the epigastrium, and hot fomentations. The purging continued frequent throughout the day, the stools were like rice-water; and, by the evening, the skin was more damp or cold, the pulse feebler, the eyes sunken, and the voice scarcely audible. Pills of acetate of lead, with minute portions of opium, and brandy and water for drink, and application of heat to the body, were tried without any effect in arresting the progress of the symptoms. At midnight, his pulse was scarcely perceptible; and his respiration had become greatly oppressed. The liquor lyttæ was rubbed into the chest, and produced moderate vesication, but without any decided improvement of symptoms: the disease went on to a fatal termination, which took place on the morning of the 16th. A post-mortem inspection of the body showed that the lungs were collapsed, the cavities of the right side of the heart filled with dark fluid blood, and the *glandulæ solitariæ* of the colon prominent and enlarged. There was also some venous congestion of the substance of the brain, as met with in other more rapid Cholera cases.

The intimate connexion which appears to exist, in malarious countries, between the gastro-enteritic, dysenteric, choleroid, and febrile affections, from which Europeans suffer, is indicated by the same atonic and congestive character that leads us to infer similarity of cause and community of origin in such cases. Where such analogy of symptoms presents itself to observation, we naturally conclude that a like series of morbid changes takes place in each variety; nor can there be much cause for doubt, that such changes commence in the blood. Common diarrhœa, dysentery, or gastro-enteritis, unconnected with blood-lesions, will not, of course, terminate in Cholera; but where the cessation of endosmotic function in the pulmonic cells, as a consequence of blood disease, takes place gradually, and is accompanied by increased exosmotic action of the mucous intestinal surface, the attack may commence with all the symptoms of common diarrhœa, and terminate, in a day or two, as a case of true Cholera. The following is a good illustration of the successive morbid changes effected in cases of this kind.

CASE II. James Randall, æt. 40, seaman of the Government steamer Cleopatra (admitted into hospital, May 22, 1840)—states, that he was attacked last night with vomiting and purging, accompanied by cramps of the upper and lower extremities, but made no complaint of his ailments till this morning, when he was treated for diarrhœa, on board the receiving-ship Hastings. Countenance sunken; voice and pulse feeble; tongue covered by a white film; skin cold and damp. Acetate of lead pills were given every half-hour, along with half an ounce of brandy in warm water; his extremities were shampooed, and bottles of hot water applied to his feet; the liquor lyttæ was rubbed into the epigastrium, and a blister afterwards applied. 11 A.M. Pulse more developed. Three or four rice-water-like stools have been passed since admission. An enema of acetate of lead and tincture of opium was administered, and ordered to be repeated if the purging continued. 12 A.M. Has had three stools since last report, and is disposed to sleep. 2 P.M. Has been only purged once; the stool passed is like rice-water; pulse of better strength. 4 P.M. Bowels moved twice; stools of a pale grey colour; pulse of moderate strength, and soft; headache complained of. Two pills of ten grains of calomel, with one of ipecacuanha, and one of opium, to be given along with a warm salt water enema.

May 23. The calomel and opium pills were repeated yesterday evening at eight o'clock, soon after which time, the purging of rice-water stools recommenced. Acetate of lead pills were again given during the night, and the purging ceased. The calomel and opium pills to be repeated as yesterday. *Vespere.* Bowels moved several times since morning; stools green and mucous; headache gone. ℞ Hydrargyri cum cretâ et quinæ sulphatis aa. gr. ii; pulveris ipecac. et opii aa. gr. i. M.; fiat pilula horâ somni sumenda. Utatur balneo calido; injiciatur enema anodynum si perstet diarrhœa, vel adsint tormina intestinorum.

24th. *Mane.* Bowels once moved during the night. Continuentur medicamenta heri prescripta.

25th. A small dose of carbonate of soda with rhubarb, taken this morning, acted more severely on his bowels than might have been expected, and produced much languor, accompanied by a cold clammy moisture on the skin. He was seized towards the afternoon with convulsions, became comatose, and died during the night.

A post-mortem examination, five hours after death, revealed the usual morbid appearances observable in Cholera, viz., turgescence of the membranes of the brain, abnormal distension of the blood-vessels of its substance, with copious serous effusion into the ventricles. The lungs were emphysematous, and there were the usual marks of congestion visible in the heart and abdominal viscera.

The following is a case of *Spasmodic Cholera*, which had scarcely any of the premonitory symptoms incident to the diarrhœal modification of this disease; but as the spasms belong properly to a stage of Cholera, they cannot well be considered as the groundwork of distinction in varieties of this disease.

Case iii. March 21st, 1840. Absalom Bradley, aged 36, a private of H.M. 6th regiment, admitted at noon into hospital by Dr. Morehead. Stated he had been taken ill about nine o'clock in the morning, since which time he had vomited several times, and had passed as many as five or six stools, one of which, voided since his admission, has the appearance of rice-water. Skin of nearly natural temperature. A warm bath to be used immediately, and a pill of six grains of calomel, with 1½ grain of opium, given. A mustard cataplasm to be applied to the epigastrium. 2 p.m. One copious rice-water-like stool passed since last report; stomach still irritable. The liquor lyttæ to be well rubbed into the epigastrium, and a large blister afterwards applied. An acetate of lead enema, with tincture of opium, to be used; and pills of acetate of lead and opium to be given every half-hour, along with small quantities of brandy and water. 4 P.M. Three pills taken, two of which were vomited soon after. The acetate of lead enema, with opium, was repeated about an hour ago; since which time two scanty rice-water-like motions have been passed. Pulse and skin more natural, and cramps less troublesome. 5 P.M. One scanty stool since last report; skin covered with warm perspiration; pulse feeble; cramps have ceased. The pills to be continued every half-hour, and small quantities of warm arrowroot, with an ounce of brandy, to be given to the patient every hour, or second hour, according to the strength of the pulse. 9 P.M. Had two scanty rice-water like stools about seven o'clock, since which time there has been no recurrence of purging; pulse good. Arrowroot and brandy omitted. Pills of acetate of lead and opium to be given every third hour.

22nd. Four pills given during the night; several dark grey stools passed; little or no secretion of urine; slightly increased temperature of skin; pulse of good strength. ℞ Sulphatis quinæ, calomelanos aa. gr. vi; opii gr. i; confect. aromaticæ, q. s. ut ft. massa, in pilulas æquales tres dividenda, quarum sumat unum 4tâ quaque horâ. Sumat haustum misturæ camphoræ, ℥i ss., cum acetatis potassæ, et spiritûs ætheris nitrosi aa. ʒi. Sago, with wine, to be given thrice a-day. *Vespere.* Two scanty grey stools passed since the morning; urine scanty; stomach irritable; tongue coated; skin natural, and pulse good. ℞ Calomelanos, gr. vi; pulveris ipecac., gr. ss; opii gr. i. Fiat pilula horâ somni sumenda, et nocte, nisi dejecerit alvus, repetenda. Sumat olei ricini ʒiv cras mane

23rd. Two light grey stools in the night; some urine passed; pulse soft and skin moist; tongue still coated. Castor oil not given. Sumat pilulam sulphatis quinæ, calomelanos, et opii, antea præscriptam tertiâ quâque horâ. Habeat haustum misturæ camphoræ, et spiritûs ætheris nitrosi. *Vespere.* Urine passed freely; pulse good, and skin natural. Capiat cras mane olei ricini ʒiv.

24th. *Vespere.* Had a good night; urine free; tongue cleaner; skin natural; several bilious yellow stools have been passed since the oil was given in the morning. The symptoms from this date continued to amend; and the patient was discharged well on the 1st April.

The diarrhœal modifications of the disease, classed by some as *pseudo-Cholera*, can be only viewed properly as imperfectly developed forms of true Cholera, wherein the abnormal functional changes in the blood are followed, more or less suddenly, by a complete development of the symptoms which characterize the more advanced or collapsed stage of the disease. The time which may elapse from the first manifestation of diarrhœal symptoms to the period of complete development, varies according to the intensity of the Cholera poison, and the quantity and depressing effect of the diarrhœal discharges. Sometimes, flatulency and distension of the stomach and abdomen, accompanied by anxiety at the precordia, chilliness of the whole surface of the body, and by diarrhœa of yellow watery evacuations, or bilious green and serous stools, precede for many days the symptoms of collapse; the surface then becomes livid, and is bedewed by a cold unctuous sweat, attended by white rice-coloured dejections from the bowels. On other occasions, symptoms of pyrexial reaction, burning pain at the epigastrium and navel, cramps of the abdominal muscles, vomiting and purging of thin mucous fluid, and a partially hot skin, may be met with as intermediate between the diarrhœal and the asphyxial or collapsed form. Such cases constitute the febrile or gastric modification of the disease; the treatment of which, though not attended by the same amount of success as attends the earlier diarrhœal forms, is more likely to be followed by recovery than in the slowly collapsed *asphyxial* modification.

Cholera being easy of cure in its earliest stage, or diarrhœal modification, it is of great importance to ascertain, by symptoms, how far such choleroid cases differ from simple diarrhœa. Fortunately, we possess the means of doing so, by testing, in all doubtful cases, the urine; which Mr. Busk and Dr. Rostan find to be albuminous at the beginning of the attack, and for several days after. *Whenever, therefore, there exists any cause for suspicion that the diarrhœa is choleroid, and may, if neglected, end in complete development of Cholera, we should examine the urine for albumen both by the nitric acid and heat tests.*[1]

2. *Pyrexial Modification.* In this class of cases, the cause has only in part developed its effects, or been followed by temporary cessation of endosmotic function in the pulmonic cells, and partial destruction of the heat-producing process. Incomplete and sometimes successful attempts at reaction are made by the constitution, to restore to health the impeded circulation of the pulmonary capillaries; and here the burning pain at the epigastrium, and the partially hot skin, which are indications of such reaction, evidence the constitutional effort which Nature makes to anticipate, as it were, that more active secondary fever and inflammatory reaction, which, as the fourth and last stage of Cholera, succeed to symptoms of grave collapse. The following case will illustrate modifications of this kind:

Case iv. July 4, 1840. Stephen Dewer, aged 22, a seaman from one of the ships now in harbour, was attacked this morning by vomiting and purging of watery matter, accompanied by occasional spasms of the abdominal muscles; stools passed since admission have the appearance of rice-water; pulse frequent and feeble. Sumat pilulam acetatis plumbi et opii omni semi-horâ; injiciatur statim enema acetatis plumbi, gr. x; solutæ in decocto oryzæ ℥vi, cum tincturæ opii ʒss. ℞. Liquoris lyttæ, ℥ss; quo perfricetur epigastrium, et postea tegatur emplastro lyttæ amplo. *Vespere.* Five pills have been taken and the enema administered; vomiting and purging have ceased; no return of the abdominal spasms; skin of moderate temperature, and soft; pulse of better strength, and easily compressible. The blister has produced moderate vesication. Continuentur pilulæ secundâ quâque horâ. 9 o'clock, P.M. Is from time to time troubled by severe cramp of his legs; pulse somewhat full and sharp. Mittatur sanguis e brachio. After eight ounces of blood had been abstracted, the pulse became more compressible, and lost its sharpness. Continuentur pilulæ tertiâ quâque horâ.

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[1] The albuminous character of the urine, in the two first stages of Cholera, is additional proof that the symptoms of these stages sometimes originate from congestion of the kidney and other abdominal organs; as a like state of albuminuria during the cold stage of ague and the congestive stage of eruptive fevers, was long since observed by Dr. Charles J. B. Williams, as mentioned in his highly philosophical and instructive *Principles of Medicine*, p. 193.

5th July. No return of cramps since the bleeding; urine passed in moderate quantity; skin and pulse soft. Four pills taken; no return of purging. Sumat haustum effervescentem secundâ quâque horâ. Continuentur pilulæ. Small quantities of sago and wine to be given to the patient at short intervals. *Vespere.* Is quite easy; bowels have not been opened; tongue somewhat coated. ℞ Calomelanos, gr. vi; sulphatis quinæ, gr. ii; opii, gr. ss. M. fiat pilula horâ somni cum haustu effervescente sumenda.

6th. Bowels not yet opened. Sumat statim olei ricini ʒvi, ex haustu aquæ menthæ piperitæ. *Vespere.* Bowels twice moved; stools passed with griping. Repetatur pilula calomelanos et opii. Sumat cras mane olei ricini ʒiv, et tincturæ opii m. x, ex haustu aquæ menthæ piperitæ.

7th. Bowels have not again been moved; occasional cramp in his toes complained of. Capiat cras mane olei ricini ʒvi.

8th. Complains of pain at the epigastrium, increased by a deep inspiration; pulse natural. Admoveantur epigastrio hirudines l. Sumat haustum effervescentem ter die.

9th. *Vespere.* Has been much griped throughout the day; pulse and skin soft. ℞ Calomelanos gr. iii; pulveris ipecacuanhæ compositi gr. x. M. fiat pulvis horâ somni sumendus. Sumat cras mane olei ricini ʒvi.

11th. Bowels gently moved yesterday by the oil. Is complaining of slight rheumatic pain in the muscles of his right leg and left shoulder. Utatur balneo fervente horâ somni. Illinatur parti dolenti linimentum camphoratum mane nocteque.

13th. Rheumatic pain of his limbs lessened; bowels gently moved by a small dose of rhubarb and carbonate of soda, given yesterday. ℞ Pilulæ hydrargyri, gr. i ss; pulveris ipecacuanhæ, gr. i; opii, gr. ss; extracti gentianæ, gr. iij. M. fiat pilula mane nocteque sumenda. Sumat cras mane olei ricini ℥i, ex haustu aquæ menthæ piperitæ.

15th. Bowels moved several times yesterday; stools watery yellow, and passed with tenesmus; tongue clean; pulse of natural frequency. Omittantur medicamenta.

16th. Complains of pain and tenderness along the ribs of the left side, and in the cardiac region, accompanied by difficult respiration and headache. Admoveantur pectori sinistro hirudines l. ℞ Magnesiæ carbonatis, ℈i; magnesiæ sulphatis, ʒvi; tincturæ gentianæ compositæ, ʒiss; vini colchici, ℈ii; aquæ menthæ piperitæ, ℥iiss. M. fiat haustus statim sumendus.

17th. Complains of tenderness at the upper part of the sternum, and uneasiness in the superior portion of the left chest, where the respiration is puerile, accompanied by obscure vesicular murmur; headache not lessened; pulse of natural frequency; tongue furred and deficient in moisture; bowels gently moved by the draught. ℞ Pulveris ipecacuanhæ, ℈i; vini ipecacuanhæ, ʒii ss; aquæ fontanæ, ʒi. M. fiat haustus emeticus statim sumendus. *Vespere.* Much muco-bilious matter brought away by the emetic; uneasiness of the left chest relieved; headache continues. ℞ Hydrargyri cum cretâ, gr. iij; pulveris ipecacuanhæ compositi, gr. xii. M. fiat pulvis horâ somni sumendus.

18th. No uneasiness in the left chest; slight rheumatic tenderness of the sternum; bowels not moved during the night. Sumat statim olei ricini ℥i, ex haustu aquæ menthæ piperitæ. *Vespere.* Bowels moved several times; tenderness of the scalp at the vertex; pulse full, but soft. Admoveantur temporibus hirudines xxx.

19th. Tenderness of the scalp not lessened. ℞ Misturæ antimonialis ℥i; vini colchici, m. x; morphiæ muriatis solutionis m. xv. M. fiat haustus bis die sumendus.

20th. Tenderness of the scalp lessened. Repetatur haustus magnesiæ sulphatis et vini colchici 16mo. prescriptus. *Vespere.* Bowels moved three times; headache and tenderness of the scalp as yesterday. Mittatur sanguis e brachio ad uncias xviii. Repetatur haustus misturæ antimonialis et vini colchici 19mo. præscriptus.

21st. Passed a restless night; headache and tenderness of the scalp as yesterday. ℞ Misturæ sulphatis quinæ ℥iii; vini colchici, m. xv. M. fiat haustus ter die sumendus. Sumat horâ somni pilulam calomelanos gr. iij; pulveris ipecacuanhæ, gr. i; et morphiæ muriatis, gr. ss.

22nd. Passed a good night, and slept soundly; no headache. Sumat ter die misturam sulphatis quinæ et vini colchici antea præscriptam. Repetatur pilula calomelanos et muriat. morphiæ, ut antea.

24th. Free from complaint, and permitted to leave the hospital.

The phenomena of Cholera generally, and those which constitute its various modifications, may be considered as manifestations of the pathological conditions of the organs in various stages of the disease; which conditions, however, are developed regularly or irregularly, according to the constitution of individuals, and the particular predisposing and exciting causes of the Cholera. When reaction takes place between the stage of congestion and that of *well-developed Cholera*, as in pyrexial modifications of it, this must be viewed as a pathological condition of inflammation or fever, which, though it may not happen in the usual series of effects, must be treated accordingly The cases in which Mr. Burrel, surgeon of her Majesty's 65th regiment, employed blood-letting so successfully, during the prevalence of Indian Cholera in the year 1818, appear to have been of this kind; and the following case is a further illustration of like pyrexial modifications.

CASE V. Sept. 3, 1818. William Jones, a young, healthy, European soldier, admitted into the garrison hospital, at Tannah, for a contusion of his foot. Went to sleep yesterday evening, leaving the two windows near his bed open, by which he was exposed to the night air. Awoke, sometime after midnight, with pain at the epigastrium, followed soon after by vomiting, chilliness, and cold skin; to which vertigo and purging succeeded. The head was so vertiginous, that the patient fell down several times on his way to the hospital privy; and there was a cold, clammy perspiration on his body during the whole night. Made no application for medicine till the hour of my morning visit to the hospital; when his pulse was feeble and labouring, his stomach irritable, his skin very cold, and covered by clammy moisture. A dose of fifteen grains of calomel, and the usual draught of tincture of opium, rectified ether, and spirit of ammonia, were given, but rejected almost immediately by the stomach. The medicines were again given and retained; and the patient being then put into a hot bath, was bled from the arm to the extent of fourteen ounces. 3 P.M. The draught last given was not long retained by the stomach; epigastric tenderness and pain still complained of; pulse labouring. Sumat statim calomelanos, gr. xv; cum haustu tincturæ opii et ætheris rectificati antea præscripto. Mittatur sanguis e brachio ad uncias xii. 6 P.M. The pulse rose somewhat at first as the blood flowed from the arm, but soon after sank very low; the calomel and laudanum draught were repeated as before, and the patient put to bed, with plenty of warm covering over him, and bottles of hot water to his feet and legs. Dr. Jukes, surgeon of the garrison, had visited the hospital at 4 P.M., and ordered a blister to be applied to the epigastrium. Symptoms the same as at last report. ℞ Assafœtidæ gummi-resinæ ʒvi; sulphatis magnesiæ, ℥ii; aquæ calidæ, ℥xii; tere intimatim, solve, et cola; adde liquori tincturæ opii et tincturæ castorei aa. ʒiss. M. ut fiat enema statim injiciendum. 8 P.M. Is much easier, the violent pain in his stomach and bowels having been greatly relieved by the enema; the injection of which was followed by a warm glow on the skin, and gentle perspiration. The blister has not yet produced vesication.

6th. 10 A.M. The blister has produced free vesication. Respiration more free and equable; pulse frequent and feeble; hands and feet of moderate warmth. Injiciatur statim enema assafœtidæ antea præscriptum. 6 P.M. Feels quite easy, and seems in a fair way of recovery. Skin warm and perspirable; one watery clay-coloured stool brought away by the enema.

7th-10th. Nearly well; has had one clay-coloured stool from some calomel and opiate confection, prescribed yesterday evening by Dr. Jukes. Left the hospital quite well on the 10th September.

3. *Asphyxial (or Collapsed) Modification.* In the more severe cases of this kind, there are generally no premonitory symptoms of lassitude and nervous depression, diarrhœa, or sensibly progressive congestion; but the patient is, as it were, struck by lightning, and falls down insensible, after a sudden attack of vertigo; lies with half-closed eyes, but has not altogether lost his consciousness; breathes heavily and sighs often; has an interrupted, thready, or almost imperceptible pulse, accompanied by slow action and irregular rhythm of the heart. The eyes are sunk in their sockets, and surrounded by a dark circle; the conjunctivæ are injected with blood; the lips are livid; and the extremities ice-cold and blue, accompanied by a peculiarly corrugated state of the skin, resembling the hands of a washerwoman. These symptoms may be attended by frequent choleroid evacuations from the bowels, though sometimes little or no purging precedes such attacks, and in all bears no relative ratio to the severity of the other symptoms. Sometimes this symptom is altogether absent during the prevalence of like epidemic attacks, where the presence of all the other symptoms, just enumerated, leaves no doubt of such being modifications of Cholera. Such was the case already narrated in the history of the disease in 1818.

Symptoms and Stages collectively. The characteristic symptoms of *Cholera algida*, which declare the nature of the disease, are those which have their origin from morbid changes in the respiratory, circulating, and nervous systems; by which the voice is weakened, the inspirations rendered shallow and frequent, the respiratory murmur lessened, the action of the heart made slow and irregular, the pulse interrupted and thready, the extremities and lips livid, the exhalation from the skin and intestinal surface increased, the secretion of urine suppressed, and the animal heat diminished to a standard little short of the coldness of death. These symptoms vary in their progress and intensity, according to the original or acquired constitution of individuals; but generally come on in a certain order or progression, constituting stages of the disease: irregularities in which, or interruptions of their usual course, give rise to the several modifications I have mentioned. It is from this very irregularity, that the disease is sometimes so much more unmanageable than at others; depending, as it appears, on the greater or less intensity of the atmospheric cause, and the predisposition of individuals affected. On the first breaking out of an *epidemic Cholera*, cases of a severe type generally prevail, which become milder as the disease is disappearing. In ascertaining the value of particular remedies in the treatment, it is necessary to estimate, with precision, these conditions and circumstances; and it is of no less importance, if we would secure the probable success of such remedies, and consult the safety of particular cases, that we should not be led by a blind empiricism in our practice, but endeavour to ascertain, by an accurate discrimination of the particular modifications and stages of Cholera, what specific remedies may be applicable. A summary of the course and progress of symptoms may be conveniently arranged under FOUR STAGES: 1st, the premonitory stage of depression, or diarrhœa; 2nd, the stage of congestion, or development; 3rd, the algide stage, or that of collapse; and 4th, the well-marked stage of reaction, or consecutive fever, which is not an *essential or invariable part* of the disease, but follows as a *contingent condition of congestion* in some cases, by which the parts affected are restored to activity, and poisonous products in the blood eliminated by the secretory organs maintaining their natural functions, without yielding to a state of inflammation.

First Stage. The symptoms of this stage varied in different individuals. In some, the digestive organs were disturbed, attended by fulness of the stomach, flatulence, slight colic, dryness of the palms of the hand, yawning, and indescribable languor. In others, a sense of fulness in the stomach, accompanied by a painful sense of anxiety at the præcordium, listlessness and depression of spirits, preceded pain in the præcordial region, which was followed by diarrhœa, at first of a dark yellow colour, sometimes of a bilious green. This stage was present in the majority of Indian cases; but was not always sufficiently well marked, or of long enough duration, to be taken into account by the patients. In some, it lasted two or more days; but its period may be said to extend from the first disturbance of the digestion, and symptoms of nervous depression, to the appearance of Cholera stools, or spasms.

Second Stage. This was generally one of rigour, or chilliness. The patient's countenance had an expression of great anxiety, and was of a dusky brown hue, or livid cast. The alvine evacuations, which were in the first stage fæculent, now became like rice-water, or serous, mixed with flakes of mucus; but, in some instances, they were of a leaden, turbid appearance. Vomiting of watery matter, similar to the dejections in colour, accompanied by epigastric pain, was generally simultaneous with the purging. As the vomiting and purging progressed, and became urgent, the cyanosis of the face, neck, and extremities, increased in proportion; the skin became extremely cold, and bedewed by clammy sweat; the voice hoarse; the pulse small, and rapid; the eyes deeply sunken; accompanied by urgent thirst, deafness, and frequent violent cramps of the legs, thighs, and arms. In the earlier part of this stage, small quantities of urine were sometimes passed; but, during its latter period, the secretion from the kidneys was altogether suppressed. The complete development of these symptoms, or a more vigorous circulating system and higher degree of nervous tone in individuals, giving rise to feeble constitutional efforts of reaction in this stage, might be said to form that modification of Cholera which I have called *pyrexial.*

Third Stage. In this stage, the discharges from the stomach and bowels became less frequent, or almost ceased; the spasms were nearly at an end; the pulse, if it had not ceased, was scarcely perceptible; the whole body was bathed in cold, clammy, perspiration; the skin of the hands and feet was icy cold, and corrugated, as if long steeped in water, though many patients could not bear the bed-clothes, and complained of burning heat of skin; there was much constriction of the thorax, accompanied by breathlessness, jactitation, and anguish; the eyes were half covered by the eye-lids; and the dying man, though still conscious, appeared almost in a state of stupor. Some degree of disorder in the respiratory, circulating, and nervous systems, seemed to precede the symptoms of the *second stage;* but in this more *intense form* of the disease, the oppressed respiration, the embarrassed and struggling heart, the loss of nervous irritability, the cessation of all secretions, and the death-like coldness of every part, indicated that all the powers of life were paralyzed, and that vital action was at its lowest ebb. The apoplectic form of the disease is but a modification of this stage, wherein the cerebral functions are at once suspended, by the amount of congestion in the head; while the impeded functions of respiration, circulation, and calorification, are more recently and suddenly affected; and are attended by less real debility than when they occur more gradually.

Fourth Stage. The symptoms, and complications of reaction, have a near relation to the conditions of the third stage; as much, indeed, as sweating, or inflammatory complication in fever, bears to the cold stage. At the period of reaction, the surface of the body became gradually warmer, the skin, from being livid, resumed its natural colour; and the perspiration returned to its healthy warm state. The vomiting, cramps, and diarrhœa ceased; and there was a stronger and fuller pulse, more equable and natural respiration, and a return of both the urinary and biliary secretions, the evacuations from the bowels being now of better consistence, and green. Sometimes, however, as in the hot stage of fever, inflammatory complications of the stomach and liver took place, during the general increased action of the circulating system, with a not unfrequent constitutional *æsthenic* tendency, to sinking of the pulse, coldness of the skin, reappearance of the vomiting, return of the Cholera evacuations, and such final prostration of the powers of life, as to terminate in death, after reaction had promised recovery.

III. PARTICULAR SYMPTOMS ORIGINATING IN THE PERVERTED FUNCTION OF INDIVIDUAL ORGANS.

Gastro-enteric Discharges. In fever and common Cholera Morbus of the autumnal months, the discharges from the stomach and bowels consist of vitiated secretions of the abdominal viscera; but in the disease known under the name of *Asiatic Cholera*, running into the asphyxial form, the several gastro-enteric secretions are suspended, though there be copious intestinal discharges, consisting, according to the best chemical examination, of effused *blood plasma*, exuding from the capillaries after normal secretion has ceased. The occurrence of these discharges, which bear, as I have said, no relative ratio to the severity of the other symptoms, seems, however, secondary to the blood lesion, from which those abnormal changes in the respiratory, circulating, and nervous systems, which constitute the phenomena of Cholera, derive their origin. The vomiting was not so constant a symptom in the first stage of the disease as was the diarrhœa, but generally appeared with the development of the second stage. Both have been considered, by some observers, as curative efforts of the system, to relieve the congestion of the abdominal venous capillaries; but this opinion is irreconcilable with the beneficial therapeutic effect of astringents, in combination with medicines that allay irritation, to restrain the excessive intestinal exhalation of Cholera fluid, containing, as Dr. Parkes and others have ascertained,[1] an abundance of alkaline chlorides, phosphates, and sulphates, and a certain proportion of albumen, along with masses of flocculent matter, considered by Andral to be *modified mucus*, but viewed by Parkes as *modified fibrine*, like what is exuded in the low organization taking place in the follicular deposit of typhoid fever. Masses of this exudation block up the biliary duct, and render viscid the biliary secretion, which is obstructed in its course, but is not altogether suspended.

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[1] London Journal of Medicine, No. II, for February 1849, pp. 141 and 151.

Boehm, who first completed the microscopic examination of these *cholera masses*, referred them all to changes in the epithelial coat,—an opinion which Dr. Parkes satisfactorily shows to be erroneous, there being no proof of the separation of the epithelium until after the death of the patient. *The stools contain a quantity not more considerable than is present in common diarrhœa, if even so much.* It is therefore evident, that the normal *gastro-enteric* secretion is suspended, and that the fluids exuding from the stomach and bowels contain portions of the blood constituents, some of which appear to be rather *altered* in *quality* than *increased* in *quantity*. The relation of these phenomena to the physical condition of the blood and its component elements, is an important link of investigation in the chain of effects, which binds together the progressive phenomena of Cholera; and though much has been already done, yet much remains to be effected by future investigators, to account for discrepancies of result, and establish the truth.

Physical and Chemical Condition of the Blood. In the epidemics of 1818 and 1819, both Europeans and Asiatics were generally bled when attacked by Cholera; but, though I frequently opened the temporal artery and jugular veins, in the worst collapsed cases which were then received into hospital, the blood was so viscid, black, and tar-like, that I seldom succeeded in obtaining any considerable quantity even while the patients were in the hot bath. In the earlier periods the blood flowed more freely from the veius of the arm, though it trickled down in a small, feeble stream, the central portion of which had a florid appearance, while the parts on either side were much darker. When left to coagulate, the clot was soft and loose, and its top covered sometimes by a thin, sizy film. The cases in which this film appeared were chiefly of a gastric character, such as some Continental writers denominate *Cholera Sicca*, being accompanied by a slight degree of diarrhœa, but by much burning pain at the præcordia, great irritability of the stomach, sometimes vomiting of watery fluid, intense thirst, a small frequent pulse, and less diminution of animal heat than usually attends the more severe forms of the disease.

The alterations which the blood undergoes in composition are yet more important than its exterior character, in enabling us to judge of the general condition of the system in these attacks. Dr. Garrod's late communication on the Pathological Condition of the Blood in Cholera,[1] contains the results of former investigations, and what we have since learned on the same subject. All these analyses tend to show that the water of the blood is much diminished in quantity, and that there is a corresponding increase of the solid portion, especially of the albumen;

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[1] London Journal of Medicine, No. V, for May 1849, p 409.

that the diminution of its alkaline reaction is not due to the loss of salts, but to the impeded excretion of organic acids constantly formed in the system; that the fibrine undergoes changes of quality rather than of quantity; and that urea, in increased quantities, exists, but that the amount differs considerably in the different stages of the disease; being but small in the intense stage of collapse, increasing during reaction, and in excess when consecutive febrile symptoms occur. The relation of these changes to the ascertained nature of the *gastro-enteric discharges* must be manifest, viz., an increased secretion from the alimentary mucous membrane, of thick, white, mucaginous matter, much resembling pus, but probably consisting of modified fibrine, and generally accompanied by excessive intestinal exhalation of water from the blood, carrying with it a certain amount of salts, and causing the darker colour and more viscid state of the circulating fluid, which thus attains a maximum of specific gravity and tenacity, that render it unfit for healthy secretion and the ordinary vital operations of the system.

It may be necessary here to notice that disorganization of the blood corpuscles, which, according to the microscopic observations of Professor Webb of Calcutta, and of others, has been found existing in Cholera, and has been regarded by them as the cause of that loss of power in the blood which renders it incapable of absorbing oxygen, destroys its normal endosmotic power in the lungs, and gives rise to that paralysis of the pulmonary capillaries from which all the morbid changes observed in Cholera necessarily follow. Some further observations on this head are required to establish, or disprove, the truth of these conclusions; Dr. Gairdner having lately found that the microscopic appearances of the blood presented nothing unusual; and Dr. Garrod having seen only in one case, any abnormal appearance of the blood under the microscope.[1]

Respiration and Circulation. Anxiety at the præcordia, and some degree of embarrassment in the pulmonary circulation, marked by yawning and sighing, seemed to attend the first and second stages; but in the *third* one, and period of full development, the respiration became quick and anxious, as if the lungs were imperfectly filled by the inspired air. Prior to 1839, I made no observations on the sounds of either the respiration, or of the heart; and, such being imperfect, I must here have recourse to Dr. Parkes's excellent and instructive remarks on this subject, the truth of them being established by the pathological anatomy of the disease. Slight dyspnœa, tightness, and oppression, were very usual symptoms in the sixty-nine fatal cases seen by Dr. Parkes. The average number of respirations was sometimes very great at a comparatively early period; the majority breathing from twenty to twenty-eight times in the minute, when first seen. The stethoscopic indications of change in the pulmonary organs connected with these symptoms, were, an evident lessening of the inspiratory murmur, which become shorter and bronchial in character, while the expiratory murmur became more lengthened and audible than usual. In several cases, muco-crepitant, mucous, or sonorous râles, were heard at times in one part or other of the chest.[1] Paralysis of the pulmonary air-cells, from loss of power in the blood to become arterialized, and increasing debility in the muscles of the glottis, and those which dilate the chest, by which normal respiration is brought to a close, will account for that *aphonia* which forms so remarkable a feature of some Cholera cases, where the patients cannot speak beyond a whisper.

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[1] London Journal of Medicine, vol. i. p. 423.

Synchronous with, if not prior to, these abnormal changes of the respiratory movements, the arterial column of blood was found to be diminished, and the venous circulation proportionately obstructed. The impaired action of the heart was in constant ratio to the smallness, rapidity, or intermission, of the pulse at the wrist, which was generally increased in frequency, and very feeble.

Cyanosis, Diminution of Heat, and Cold Sweats. The blue tint of the skin, which was so general a symptom of the worst forms of the malady, had its origin in that imperfect sanguification by which the unoxygenated arterial blood is conveyed in a nearly venous state to the cutaneous capillaries, as manifested by the livid appearance of the extremities, and particularly the skin covered by the nails of the fingers and toes.

This pathological state of the cutaneous capillaries and their circulating fluid, admitting no longer of the usual union of oxygen and carbon, to maintain the animal heat at its normal standard, is followed by a diminution of it on the surface of the body, and a suspension of the natural sebaceous secretion from the skin, with a corresponding increased exhalation of watery vapour.

Præcordial Pain and Cramps. The painful sense of pressure at the præcordia, and the commencement of cramps, were most generally associated together in cases where the nervous energy was partially depressed, or in those where slight symptoms of reaction appeared. The most usual period of the appearance of these muscular spasms, was towards the end of the second stage, when there were present symptoms of irregular or defective innervation, with distinctly marked indications of venous congestion; but, as nervous irritability decreased, and the powers of life became paralyzed in the progress of the third stage, the cramps altogether ceased. The relation between them and the symptoms of *gastro-*

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[1] Researches into the Pathology and Treatment of Asiatic Cholera. By E. A. Parkes, M.D. Lond. p. 67.

enteric irritation seemed to be most intimate; and their severity was in constant ratio to the irritability of the intestinal mucous surface, and its efforts to expel the scanty flocculent stools which followed the more copious watery purging. These cramps chiefly attacked the superior and inferior extremities, and may be viewed as the result of reflex irritation acting on the cerebro-spinal axis.

IV. POST-MORTEM APPEARANCES AND PATHOLOGICAL ANATOMY.

Two very valuable and interesting memoirs on the anatomico-pathological appearances in Cholera have been lately given to the public: one of these, in the *Monthly Journal*, is by Dr. W. Gairdner, Pathologist to the Royal Infirmary of Edinburgh; the other, by M. Raikem, was communicated to the Belgian Academy of Medicine.[1] In the former, only slight allusion is made to the condition of the lungs and other thoracic viscera; and in the latter, several important points of investigation are but partially noticed. Many and varied opportunities, during the different years of Cholera prevailing in India, having occurred to me for correcting observations, and modifying opinions, on this subject, I shall here give several detailed post-mortem examinations, followed by a summary of pathological changes most usually present in the several modifications of the disease, in the hope that, at no very distant period, I may be enabled to present these in a tabular form, together with a more extended series of necroscopic examinations, collected from various sources.

Illustration i. *Kaira, 20th March*, 1820. Peter Collis, an artilleryman, aged about 30 years, was admitted yesterday evening into hospital, in such a state of exhaustion that he could scarcely answer the questions put to him. The men who brought him to hospital, stated that he had been attacked by the disease an hour before admission, and that, during this time, he had been purged eight or nine times, and had passed nothing but water. Stomach irritable, features shrunk and hippocratic, skin cold, pulse frequent and feeble, violent cramps in the muscles of his legs and abdomen. According to the then Indian practice in Cholera, a vein was opened in the patient's arm, and the blood allowed to flow till ten ounces had been abstracted. The pulse became more feeble, and the cramps were not relieved. Twenty grains of calomel, and a draught containing forty drops of tincture of opium, and a drachm of aromatic spirit of ammonia, were then administered. The patient was put to bed, was well covered by blankets, had bottles of hot water applied to his feet and legs, and took, every half hour, a drachm of aromatic confection, with thirty drops of aromatic spirit of ammonia in two ounces of water. The purging and vomiting continued; and when I again saw him, about an hour and a half after his admission, he was pulseless, but had still slight cramps of the muscles. Was put into a very hot bath, which caused a temporary restoration of his pulse; but he continued to sink, and died this morning about 7 A.M., or little more than twelve hours from the time he was first attacked. A necroscopic examination of the body was made about eight hours after death.

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[1] For a translation of it, see London Journal of Medicine, August 1849, p. 755.

General appearance. The skin of his face, neck, and back, was of a deep purple hue; and that of his hands and fingers shrunken and corrugated.

Head and spine. There was more than a normal quantity of blood in the large sinuses of the dura mater; the veins of the pia mater were turgid, red points in the white substance of the brain very numerous, and a considerable amount of fluid effused into the ventricles. On opening the spine, the ligamentous sheath of the *medulla spinalis* appeared distended with fluid; and on slitting it open, a considerable quantity of effused serum escaped.

Thorax. The lungs were of a deep purple hue, and emphysematous; the right auricle of the heart much distended by loosely coagulated blood, as were the two venæ cavæ.

Abdomen. The liver was of a deep purple hue generally, and in some places, particularly at its edge, quite black; there were several old adhesions between it and the diaphragm. The gall-bladder was distended by black ropy bile, which did not flow into the gall-duct even when the gall-bladder was squeezed forcibly; but on a silver probe being introduced into the duct, it passed readily, though this appeared to be obstructed by viscid mucous matter. The spleen was a little larger than natural. The mucous membrane of the stomach, which contained the rice-water he had drank, shewed spots of red vascularity near the pyloric opening. A large quantity of white thick matter, resembling mucus, was found adhering to the mucous coat of the jejunum and ileum; which appeared, after this adhering matter had been removed, to be as red and vascular as if it had been prepared with fine injection. The bladder, which was contracted, contained no urine. The kidneys were pale and granulated.

ILLUSTRATION II. *Kaira, 4th July* 1821. Thomas Foster, an artilleryman, 27 years of age, was discharged from hospital on the morning of the 3rd July, cured of chronic hepatitis. The same evening he got drunk, and slept out all night in the open air, where he was exposed to the cold and wet of the season. Was admitted this morning with symptoms of the highly collapsed form of Cholera Morbus, and died seven hours after his admission, and thirteen hours after the appearance of the first symptom. A post-mortem examination was made three hours after death.

Chest. The lungs were emphysematous and crepitant.

Abdomen. The small intestines were externally of a vermillion tint; internally, the villous coat was a little more vascular than natural, and contained a large quantity of lactiform fluid. The large intestines were contracted. A slight contraction in the middle of the stomach formed this organ into two bags. The liver was of a livid brown colour, and in the first stage of schirrhus; it presented thread-like white lines beneath the peritoneal coat, appearing like small ascarides imbedded in the glandular part. Old adhesions were found between the liver, spleen, and diaphragm. The gall-bladder was filled with dark green ropy bile.

Brain. The dura mater was adhering to the skull cap, but did not exhibit any appearance of congestion, which, however, the pia mater did. The lateral ventricles contained from four to five drachms of limpid fluid, and about one ounce of the same had been effused at the base of the brain.

ILLUSTRATION III. Serjeant-Major Tomlinson, of the horse artillery, aged 28 years, was taken ill about 6 A.M. on the morning of the 5th of July 1821. Was attacked by purging, soon succeeded by vomiting, and a considerable degree of languor and debility. The symptoms increasing in violence, he applied for medicine about 8 A.M., when twenty grains of calomel and a draught of laudanum were administered. The medicine was vomited soon after, but was repeated at 10 A.M., and with the same effect. As I myself was unwell, I requested Mr. Assistant-Surgeon Mack to see him at 1 A.M. The irritability of the stomach and bowels was then very great; the tongue white and loaded; thirst great; pulse 66, and rather full; accompanied by extreme languor. No fixed pain of any part. Mr. Mack bled him from the arm; ordered the calomel and draught to be repeated; applied a blister to the epigastrium; administered assafœtida enemata, with tincture of camphor and opium; after which remedies the vomiting was relieved, but the purging of rice-water-like stools continued unabated, and the pulse became weaker. Vertigo, with tinnitus aurium, cramps, and clammy perspirations, supervened; and all the symptoms becoming worse, he died about 12 P.M., or eighteen hours from the attack. A necroscopic examination of the body was made ten hours after death.

Head. Firm adhesion of the dura mater to the skull. The vessels of the pia mater were a little more distended with blood than usual. The lateral ventricles of the brain, which were much enlarged, contained a little bloody serum. An ounce or more of the same fluid was found at the base of the brain.

Chest. Very extensive adhesions of the pleuræ on both sides to the front part of the ribs; the lungs not fully collapsed, and of a purple hue in some parts of the posterior surface. On cutting into their substance, a frothy bloody mucus flowed from the incision, as seen in pulmonary œdema.

Abdomen. The intestines had assumed a leaden colour. The liver, which was attached to the diaphragm, etc., by several old adhesions, though not much enlarged, seemed a coagulated mass of blood. The gall-bladder was filled with dark viscid bile. The other viscera were not examined.

REMARKS. The appearances after death in these two cases are, on the whole, analogous. A greater vascularity of the pia mater than natural, effusion of serum into the ventricles of the brain, red vascular patches in the villous coat of the intestines, and marks of congestion of blood in the liver, point out a similarity of disease, though somewhat modified by the accessory circumstances of each case. The frequent watery stools which accompanied the disease, the cold extremities, and the small feeble pulse, followed the accumulation of blood in the large internal vessels of the body, oppressing the vital powers, and impeding the action of the heart. In Tomlinson's case, the quantity of blood in the liver, and the blueish tinge in the villous coat of the intestines, indicated a greater degree of congestion than there was in Foster's. The adhesions of the pleuræ in the former instance, by impeding the action of the lungs, contributed to produce this effect; and the structure of the liver in the latter seemed unfavourable to the free transmission of blood; as the thready appearance of its peritoneal coat shewed that it was approaching that state which Ballie considers the first step in the progress towards the formation of schirrhous liver. The total absence of bile in the stools and intestines, arose probably from the viscid nature of that fluid, which became an obstacle to its egress from the gall-bladder.

ILLUSTRATION IV. Tannah Garrison, 15th September 1818. A peon of the Bazar establishment was brought yesterday, 2 P.M., in the last stage of Cholera, to the Native Hospital. He had been ill between eight or nine hours, and was in a state of extreme collapse, all arterial action having ceased. Died in the course of the night. A post-mortem examination of the body, seven hours after death, was made this morning.

Head. In removing the skull-cap, the vessels of the dura mater, which were lacerated, poured out a large quantity of dark venous blood; the veins of the pia mater were also very turgid, and indicated much congestion. On making a section of the brain, the red points in the medullary substance appeared very numerous; the amount of fluid in the lateral ventricles was small; the venæ magnæ Galeni were distended by blood to the size of a common crow-quill; and the veins at the base of the brain were gorged with blood.

Thorax. The lungs were emphysematous, of a deep purple posteriorly, and exhibited some sanguineous engorgement. The pericardium being laid open, the right auricle and ventricle were relaxed, and filled by dark coagulated blood; left auricle empty, and left ventricle containing a small quantity of dark blood.

Abdomen. The intestines were greatly distended by flatus. The peritoneal coat of the stomach, at the pyloric end, was of an unnatural red tint; but on being laid open, the mucous coat seemed natural. The peritoneal coat of the duodenum, jejunum, and ileum, was generally abnormally red and vascular, but in parts of a dark purple. These intestines contained a small portion of dark mucous matter, streaked with blood, adhering to the villous coat. The mucous coat of the cæcum and colon was of a dark leaden colour. The liver seemed natural; but the gall-bladder was filled with black inspissated bile. The spleen presented nothing unusual.

The post-mortem appearances in the following illustrations were recorded by Dr. Morehead, now Professor of Medicine in the Grant Medical College at Bombay, and formerly my assistant at the European General Hospital.

Illustration v. William Taylor, aged 39 years, a man of dissipated habits, and no fixed employment, admitted into hospital at 4 p.m. on the 19th of March 1840. Had passed many rice-water-like stools, and vomited frequently before admission; tongue white; countenance sunken; voice and pulse feeble; skin quite cold. Died eight hours after admission. A necroscopic examination of the body was made eight hours after.

Head. The vessels of the membranes were turgid with blood, and the substance of the brain was of a rosy tint, and presented numerous bloody points. There was a veil of serum on the upper surface of the brain, and about an ounce at the base of the skull.

Thorax. The lungs, moderately collapsed, were somewhat congested with blood at the posterior parts. The coronary vessels of the heart were turgid with blood; and the cavities, chiefly of the right side, were distended with dark fluid blood.

Abdomen. The omentum and peritoneal coat of all the intestines had a deep blush of redness. The stomach, which was much distended, filled the left hypochondriac and epigastric regions, and part of the right hypochondrium, pushing the liver within the arch of the ribs. The mucous coat of the stomach was much mammillated, thickened, and pale in colour. There was no distension of the intestines, and the mucous coat of the small ones was of a rosy tint, presenting well developed villosities, but no enlarged glands. The mucous coat of the colon was pale, and its follicles not apparent.

Illustration vi. Simon Francis, seaman, aged 22 years, admitted at 5 p.m. on the 6th of April 1840. Had been passing frequent rice-water-like stools for more than an hour before admission, and had vomited several times; complained much of oppression at his chest, and pain in the epigastrium; countenance sunken; voice feeble; pulse scarcely perceptible; tongue white, and thirst urgent. Died in little more than nine hours from the commencement of the attack. A necroscopic examination of the body was made twelve hours after death.

Head. The vessels of the membranes were turgid; and there was more than the usual quantity of effused serum in the ventricles and at the base of the brain. The substance of the brain was of a darker tint than usual, and presented many bloody points.

Thorax. The left lung was emphysematous, and the right one compressed by old adhesions. The venæ cavæ were filled with blood, but the heart was flaccid.

Abdomen. The peritoneal coat of the intestines had a light vermillion tint. The small intestines were filled with rice-water-like fluid. On these being laid open, the mucous coat at the end of the ileum was pale and studded with mucous glands, which stood in prominent relief, each white, and of the size of a mustard seed; the villi of the jejunum were distinct, and its mucous surface pale.

Illustration vii. John Paget, aged 47 years, admitted at 2 a.m. the 9th of April 1840, after having been ill for about six hours with vomiting, purging of watery stools, and cramps. Countenance not much sunken; skin damp and cold; pulse feeble. The cramps and purging ceased about an hour and a half after his admission; his respiration became greatly oppressed in an hour afterwards; and death followed at 5 a.m. on the same day, or ten hours from the commencement of the attack. A necroscopic examination of the body, six hours after death, revealed the following appearances.

General Appearance. Body stout and fat.

Head. There was moderate turgescence of the membranes of the brain, and many dotted red points were visible on incision of its substance; but there was no veil of serum on its convex surface.

Thorax. The lungs were anteriorly emphysematous, and posteriorly œdematous; the heart was loaded with fat, and its right auricle filled with blood.

Abdomen. There was a very faint blush of redness on the peritoneal coat of the intestines; the omentum was loaded with fat; and the liver was pale.

Illustration viii. Lewis Simas, a pauper, aged 11 years, admitted the 16th of April 1840. Had been suffering from diarrhœa and vomiting for three days previous to admission; said that his abdomen was tender, and that he had been passing stools mixed with blood. Leeches to the abdomen, an opiate enema, and warm bath, were administered with relief: but on the 17th, he was severely attacked with vomiting and purging, and sank rapidly from collapse. A necroscopic examination of the body was made twelve hours after death.

General Appearances. Body of a slender form.

Head. There was much turgescence of the vessels of the membranes, and a very considerable amount of effused serum on the convex surface of the brain. The medullary substance was generally soft, and shewed many bloody points.

Thorax. The costal and pulmonary pleuræ were connected together by old adhesions, and the posterior part of both lungs was œdematous.

Abdomen. The liver was natural. The mucous coat of the stomach presented marbled red patches, but was firm in texture. The intestines were somewhat distended, and their fluid contents were of a light grey colour. The patches of Peyer's glands, at the end of the ileum, were much developed. The mucous coat of the colon was of a light grey colour, and its follicles were not very distinct.

These individual illustrations of the anatomico-pathological appearances in Cholera, have been taken from cases of the disease as it appeared at various times in India. They were recorded without any preconceived notion or theory of the disease, likely to bias the mind in its observations; and having been detailed by different individuals (myself, and Dr. Morehead), must be allowed some weight, as the means of establishing or disproving questionable points of opinion on this head. They agree generally with the observations of M. Raikem, lately communicated to the Belgian Academy of Medicine; and do not bear out some of Dr. W. T. Gairdner's conclusions, "*that it is an error to conceive of congestion as an essential or universal condition in this disease.*" This remark is true, as it applies to the *liver*, *spleen*, and *kidneys*: the congested condition of the liver and kidneys being contingent on there having been little or no *exosmosis* from the intestinal exhalents and minute venous trunks of the portal vein. But, assuredly, *mechanical congestion* of other parts of the venous system, from the cessation of the endosmotic power of the lungs, is an essential condition of Cholera, and is manifested by the right side of the heart and venæ cavæ being loaded with blood, and by the cerebral veins and venous sinuses and vessels of the medulla spinalis being in the same state, greater or less, according to the smaller or greater amount of serous effusion that may have taken place from the vessels.

Post-mortem observations in Cholera cases are of acknowledged importance in studying the disease, in order to obtain a more exact knowledge of its nature, and an improved method of treatment: but, *pathological anatomy* not being *pathology*, if we would obtain a more comprehensive knowledge of the *series of morbid changes* which constitute this *most obscure* if *not incomprehensible* malady, we must study the *defects of the vital principle*, and *the diminished constitutional power of resistance against external agents, which precede and regulate* all the subsequent phenomena. It may be useful, however, and partly contribute to this most desirable investigation, as the foundation of a better therapeutic system, to give here a summary of the characteristic groups of morbid anatomical changes, in both solids and fluids, which distinguish Cholera from, or associate it with other diseases, to which it seems allied. The heads of this summary will be nearly those already given in Dr. Gairdner's valuable report referred to, with such emendations as seem necessary and are warranted by my own observation, and by the experience of others.

Before proceeding to the summary, I will here give one additional *anatomico-pathological illustration* of the present British Cholera, kindly sent to me by Dr. Cormack. The child, who was the subject of this attack, was seen in a state of collapse by Dr. Sibson and myself; and the post-mortem appearances show, how Cholera is sometimes depending on a state of *anæmia*, wherein the blood is deficient in quantity and deteriorated in quality.

ILLUSTRATION IX. Clara Udall, æt. 2 months, residing on Putney Lower Common, was taken ill on the morning of August 18th, 1849. She was violently sick, refused the breast and all kinds of food; and before I saw her at noon, had had a great number of stools. The first towels which were used, contained some matter like very soft clay-coloured mortar; but the towels in which the latter evacuations had been passed, though soaked therewith, were hardly discoloured in any way. While I was in the house, she passed a large quantity of inodorous and almost colourless fluid from the anus. A mixture of catechu and opium was prescribed; and a small quantity of brandy in beef tea was directed to be given *pro re natâ.* In the evening, the child was somewhat better.

On the following day she was again worse; but the discharge was again moderated, and for some hours arrested, by means of small doses of acetate of lead and Dover's powder.

On the 20th, she seemed improving.

On the 21st, about 9 A.M., she had a rapid succession of copious fluid motions; from which time, up to death at 7 A.M. on the 23rd, a period of 46 hours, she had no discharge either from the bowels or bladder; and remained in a state of absolute collapse, with the eyelids open, the eyes sunken, and the countenance haggard. The alteration in the countenance was described to me as having taken place quite suddenly. By means of the diligent use of hot fomentations, the temperature was maintained at the natural standard throughout the whole of this time; and small doses of brandy and beef-tea were administered every half-hour, so long as the power of swallowing remained. Shortly before death, the movements of the hands, arms, and legs, were very active; and this continued long after the surface had become quite blue. I was not present when the infant died: and those who were in attendance could not exactly say the moment at which life ceased, for after they had concluded that death had taken place, notable movements of the arms were observed. A necroscopic examination of the body was made nine hours after death.

External Appearance. The countenance was haggard, the eyelids open, and the eyes sunken. The fingers were blue; and there were extensive marks of ecchymosis on the posterior aspect of the trunk, but in no other part of the body. In some degree, the extremely collapsed appearance had disappeared before death; and the fingers were certainly not so blue as during life. There was a total absence of cadaveric rigidity in any part of the body.

Head. The vessels of the pia mater were considerably congested, but not more so than is usual in deaths from very many causes. The brain was of soft consistence. There was no effusion under the arachnoid, or into the ventricles.

Chest. On opening the chest, the integuments were found to contain a considerable layer of fat. The lungs did not collapse; and the left lung overlapped the heart. The anterior portions had a white appearance, and were œdematous, not in any way emphysematous, and bloodless. The middle parts were pallid and œdematous, not entirely destitute of blood. The posterior portions were likewise œdematous; and, in their more dependent parts, were almost black from the contained blood; but this coloration seemed to depend more on the character than on the quantity of the blood. The posterior aspect of the lung, in contact with the parietes of the chest, was deeply furrowed by the impressions of the ribs. It may be said of the lungs, therefore, that their prevailing character was œdema; and that, although there was an unequal distribution of blood in them, there was nothing which could be truly called sanguineous congestion.

The auricles and ventricles of the heart contained a very small quantity of black, thickish, but not coagulated blood. There was no fluid in the pericardium.

Abdomen. Here, as over the chest, there was a considerable layer of subcutaneous fat. On displaying the viscera, they were observed to be in their natural position. The stomach and intestines were moderately distended with air, but entirely destitute of fluid or solid contents. A brown patch, about 1 inch long by $\frac{1}{3}$ inch broad, was observed on the ascending colon, just above the cæcum. Some portions of the intestines were reserved for microscopic examination. The spleen appeared quite natural, and certainly was not enlarged or congested. The liver was rather more pallid than usual: its under surface had a tarry look. The gall-bladder had a similar appearance, and was distended with a moderate quantity of tarry, somewhat inspissated, bile. The kidneys were anæmic; they were reserved for further examination. The bladder was contracted, and contained no urine. The general deficiency of blood throughout all the organs was very remarkable.

I. Effects of Previous Disease. The conclusion, that individuals of unsound constitution are not more liable to Cholera attacks than those in perfect health, requires a greater collection of anatomico-pathological facts, than that on which this statistical induction has been made, before its establishment can be admitted. It is in complete opposition to a well ascertained law of predisposition in this and other diseases—namely, that whatever has a tendency to render sanguification and nutrition defective, to pervert secretion and weaken the constitutional powers of resistance to morbific causes, favours the production of Cholera collapse. Though many persons in perfect health were attacked by Cholera in 1818, under the strongly epidemic influence of the atmosphere then prevalent, yet the chief victims of the malady were the *aged*, *emaciated*, and *previously diseased*. The chronic lesions, found most influential in producing Cholera development, were those which impeded the due performance of the respiratory function; a conclusion fully borne out by the cases given in illustration.

II. Condition and Secretion of the Intestinal Canal. M. Raikem's observations on this head, are confirmed by those made in India. Where the amount of watery purging had been least, the mucous intestinal surface was coated with a thick layer of white creamy matter, associated with much hyperæmia of the membrane, visible after the mucous or fibrinous exudation had been removed. Sometimes the stomach and intestines contained large quantities of this whitish creamy matter, occasionally tinged with blood. Andral considers the fluid, which constitutes the rice-water-like stools of Cholera, to be only mucus secreted in large quantities and modified in its qualities; in which opinion Dr. Gairdner coincides. But Dr. Parkes, with well considered grounds for opinion, is disposed to consider *all the flocculent matter of the true Cholera stool, cells, dark yellow granules, fibres, flakes, and amorphous matter, to be but modifications of the same substance, viz., fibrine;* and that though the corpuscles seen in these Cholera masses may be mucus, yet *these fibres and flakes, in all respects chemical and microscopical, resemble those seen in the so-called inflammatory exudation matter; and it is in the highest degree probable, that they owe their origin to effused blood plasma, which assumes with great rapidity a low, ill-defined, and non-progressive organization.*[1] It is in all respects similar to the follicular deposit of typhoid fever, being a *diphtheritic exudation*,[2] similar to what is formed on the pharynx and tonsils, in certain morbid conditions of the blood, when its fibrine has lost its natural firmness and vital cohesion. It sometimes appears as an exudation of the *submucous tissue*, distending the *solitary* and *Peyerian glands*, so as to elevate them in patches; which yield, on section, a milky liquid, analogous to that found in the intestines, and noticed both by Drs. Gairdner and Raikem. The latter observed, the exudation generally confined to the *glandulæ solitariæ*, whose base was of a pearly white, and surrounded by a sort of areola of hyperæmiated arborescent vessels, with sometimes superficial ulceration at their summit. Dr. Gairdner describes the exudation as presenting itself in ecchymosed patches distinctly circumscribed, but of greater or less extent, and in tint varying from a claret colour or deepest purple to a greyish or leaden colour. The mucous membrane of the stomach and intestines was sometimes pale, but more frequently exhibited the scattered vascular portions in the sub-mucous cellular tissue, as already described.

III. Lungs. The lungs were sometimes collapsed and almost natural; but more frequently *voluminous and emphysematous;* of a dark purple colour, and œdematous at the posterior parts; the right cavities of the heart and venæ cavæ greatly distended with blood, which Mr. Lizars, in thirteen cases, found in a state of fibrinous coagulum, and the left side of the heart containing only small quantities of the circulating fluid: appearances which do not certainly support M. Raikem's assertion, that there is no *asphyxia* or paralysis of the lungs in Cholera.

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[1] Parkes on the Intestinal Discharges in Cholera, London Journal of Medicine for February 1849, before quoted.

[2] Edinburgh Monthly Journal for July 1849.

IV. Glandular Secretion. The glandular secretions, according to the incomplete investigations we yet possess on the subject, undergo alterations in quality, and are most probably diminished in quantity. The biliary secretion appears to be retained rather than suppressed; but, though apparently abundant in the gall bladder, it contains a large amount of mucous matter, and possibly morbid constituents; experiments being still requisite to determine this point. The gall-bladder has been found studded with highly-developed hyperæmiated vascular ramifications, and sometimes containing a large quantity of clear limpid fluid; indicating that its mucous coat is in the same low state of inflammatory organization as is met with in the intestinal mucous surface. The liver and spleen, however, have not presented the remarkable signs of active disease, met with among the anatomico-pathological appearances of *remittent fever.*

The state of the kidneys, in the Indian necroscopic examinations, was seldom attended to; but Dr. Gairdner's microscopic examinations of these organs are of the highest interest, more particularly when we connect his observations with the morbid state of the intestinal mucous surface as observed in Cholera. Dr. Gairdner says, *the kidneys, however, appeared in many cases to have undergone changes, the cortical substance being pale and turgid, and the tubuli uriniferi gorged with imperfectly developed epithelium, which was mostly loaded to an unusual extent with oleo-albuminous granules. A similar state of the kidneys occurs after scarlatina, and not unfrequently after typhus fever, and some other acute diseases.* This ascertained condition of the kidneys is, as it regards the condition of the blood, of the utmost importance in guiding us to a right understanding of the phenomena of Cholera. Dr. Garrod ascertained that the urea of the blood gradually increases in amount, from the cold stage to that of febrile reaction; and explains the phenomenon by supposing that, in intense and sudden collapse, the urinary excreting function and also the vital metamorphoses are diminished or suppressed, and therefore the formation of urea is likewise nearly suspended; but that when partial reaction ensues, and the vital changes take place with greater activity, urea must accumulate in the blood, if the function of the kidneys be not at the same time restored.

V. The Nervous System. The *spinal chord* was only examined by me in two cases, and in one only of these were the sympathetic ganglia, and substance of the medulla oblongata and medulla spinalis, noticed; they seemed somewhat more vascular than natural. Dr. Gairdner states that the sympathetic ganglia, and the pneumo-gastric nerves, were repeatedly examined; but nothing unusual, except, in a few cases, slight ecchymosis, was discovered. Well marked venous congestion of the substance of the brain, and of the cerebral membranes, was frequently present; in one case, softening of the cerebral substance; and, in most, copious serous effusion into the ventricles.

PATHOLOGICAL SUMMARY. Some further investigations on certain doubtful points, the chemical constituents of Cholera bile, and of the effused serosity into the brain and other cavities; more precise microscopic examinations of the state of the medulla oblongata, medulla spinalis, and ganglionic nerves; and a more extended series of chemical and microscopic observations on the conditions of the blood, its degrees of coagulation and fluidity, the tenacity of its fibrine, the ratio of its albumen and salts to the healthy standard and the appearance of the blood vesicles, seem yet necessary, before we can obtain a well established pathology and rational therapeutics of this disease. It is also of essential importance that authors state the stage of the disease, to which their observations refer. So far as our present investigations extend, they warrant us in adopting the following CONCLUSIONS.

1. That Cholera begins in a change by the blood, or morbid arrangement of its ultimate particles; by which a diminution or altered quality of its fibrine and normal ingredients takes place, impairing the formative and vital power of the circulating fluid.

2. That this altered condition of the blood, caused by unhealthy assimilation and improper food, *malarious influence*, damp ill-ventilated apartments, unhealthy exhalations from drains, and epidemic constitutions of the air, is generally manifested by certain low inflammatory exudations on the mucous surface of the stomach and intestines, accompanied by progressive, and sometimes sudden, loss of function in the nervous, respiratory, circulating, and secreting systems.

3. That the concatenation and succession of phenomena which mark the full development of a Cholera attack, consist of a depression of nervous power, a cessation of endosmotic function in the pulmonic cells, a state of congestion and arrest of the blood in the right cavities of the heart and veins, emphysema or œdema of the lungs, cyanosis and loss of animal heat, increased exosmotic exhalation from the mucous membrane of the alimentary canal and cutaneous surface, increasing carbonization of the blood and diminution of its quantity in the arterial system, suspension of the urinary secretion, and general *toxæmia*.

V. TREATMENT.

Cholera being, pathologically, a low inflammatory irritation of the mucous membrane of the alimentary canal, with deficiency of vital power in the blood to retain its fibrine in aggregation with the other elements, manifested generally by *premonitory diarrhœa*, consecutive cessation of endosmotic function in the pulmonic cells, and arrest of healthy fæcal secretion, the indications of cure are:—1. To allay irritation of the stomach and intestines, check the unhealthy intestinal secretion, and restore the natural action of the skin. 2. To support the powers of the nervous system and heart, and prevent congestion in the lower part of the brain and spinal marrow during the development of the second stage. 3. To promote and restore the biliary and urinary functions so as to eliminate *toxæmic* elements from the blood. 4. To moderate the violence of reaction, subdue cerebral and abdominal complications, equalize the general circulation, and restore tone to the system.

If the premonitory symptoms of the first stage be attended to, and timely treatment of these be adopted, by allaying irritation of the mucous surface of the alimentary canal, restraining the diarrhœa, and restoring healthy perspiration to the skin, the symptoms of the next two stages, or developed Cholera, may be generally prevented. If the stomach be oppressed and loaded by undigested contents, it will be sometimes useful to relieve it by an emetic of mustard and warm water, or one of sulphate of zinc; but caution in the administration of emetics seems necessary, lest they increase the intestinal irritation, and add to that nervous depression which precedes the development of Cholera. Purgative remedies are, for this reason, yet more to be avoided in *Choleroid* diarrhœa, as I have known several individuals in India, who, on feeling oppressed and anxious under the indigestion and slight bowel derangements which precede Cholera, took nothing more than rhubarb, and were soon after attacked by symptoms of the second stage. Case II, which has been related, under the head of Cholera modifications, was of this kind. It is therefore advisable to fulfil the first indication by administering enemata of acetate of lead and tincture of opium,[1] giving a pill of sulphate of quinine and calomel combined with catechu or extract of logwood and a small proportion of opium, to be repeated every hour, or second hour, according to the urgency of the symptoms and the persistence of the diarrhœa. Under a conviction that *gastro-enteric inflammation*, in India, associated with *diarrhœa*, generally proceeded from *malaria*, and was an effect of the same diseased irritability, which gives rise to the phenomena of fever and Cholera, I employed, many years ago, the combination of quinine and calomel, in the treatment of this class of diseases, and with much advantage. The proportion of the quinine to the calomel given was greater or less, as the diarrhœa was more or less severe; but in many cases the calomel was omitted, and one grain of sulphate of iron and a quarter of a grain of opium to every four grains of sulphate of quinine, were beneficially substituted.

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[1] The French have found injections of nitrate of silver very efficacious; and though I have never used them in Cholera, I am disposed to recommend them, having found them useful in dysentery.

Dr. Cormack, of Putney, informs me that, acting on a suggestion which I made to him, now nearly twelve months ago, he has found the citrate of iron and quinine one of the most useful medicines which can be given in the *Cholerine*, now almost universal on the Surrey side of the river. In infantile cases the remittent type is commonly well marked; and in them, specially, the combination of this preparation with astringents is useful. In the severe spasmodic cases, with much intestinal irritation, Dr. Cormack has found the *camphor-chloroform mixture* of Messrs. Smith of signal advantage, in doses of from three to six minims,[1] repeated every two or three hours, according to the circumstances of the case. This medicine may be also usefully given in combination with the creasote mixture of the Edinburgh *Pharmacopœia*, to allay vomiting; and Dr. Cormack often combines the creasote mixture and camphor-chloroform mixture with catechu, or such other remedies as may be indicated. The administration of sulphate of quinine with camphor, in Cholera, has also been found useful by Dr. Lorimer, of the Madras Medical Service; and M. Duchesne-Duparc, at Paris, has been lately recommending the former as a *prophylactic*, or rather a *curative*, for the disease. Dr. Charles Bell, of Manchester, in his two lectures on Cholera and the Epidemic Ague of Persia, recommends that the quinine should be given in combination with iron; and in anæmic cases this combination is absolutely necessary. It is, doubtless, of great efficacy in preventing the depressing effects of *Choleroid* diarrhœa, and arresting the course of the disease. The patient should at the same time use a hot bath, at the temperature of 106° of Fahrenheit, be afterwards laid in bed, and have a large sinapism applied to the epigastrium. Milder cases do well under the use of sulphate of quinine and calomel pills; but when muscular debility is a prominent symptom, and the action of the patient's heart feeble, he should be bathed in the horizontal posture on a bed, by wrapping him in a sheet wrung out of warm water, then covering him with several blankets after the hydropathic fashion, applying warming-pans of hot water till warm perspiration appears; when the patient may be laid in a dry warm bed. The danger of such cases is from syncope being induced by over exertion, or the upright posture, while the patient is in the common warm bath, the evil consequences of which I often witnessed in the first epidemic Cholera seen by me in India, where people were scalded in the hot bath, without reflection that syncope, any way induced, proves fatal to the weak circulating system. Attention to the maintaining of the horizontal posture, the employment of enemata, and all freedom from exertion, is more necessary in the second stage than even the first. To fulfil the second indication, the patient should take the quinine, combined with any preparation of iron, camphor, and a small proportion of opium, along with a draught of bicarbonate and nitrate of potass dissolved in camphor mixture, with the addition of nitrous ether; to be repeated every hour. Small quantities of brandy, or gin, in cold soda or potass water, may be given for drink; and if the cramps of the extremities be severe, the limbs are to be *shampooed*, or bandaged in the manner recommended by Dr. French. Dry cupping at the base of the skull and cervical region, cold douche to the head, the application of a large sinapism along the spine, and another on the epigastrium, will be useful in this stage of congestion, and also in the fully developed algide stage. Frictions of the limbs and chest with stimulating linaments, and the application of bags of hot sand, or bottles of hot water, to restore the animal heat, are of utility.

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[1] *Edinburgh Monthly Journal* for November 1848; also, LONDON JOURNAL OF MEDICINE, for January 1849, p. 102.

In making use of a combined tonic and stimulating mode of treatment, with diuretics to restore suppressed urinary secretion, we at once fulfil the second and third indications of the requisite treatment. The diuretics indeed may be advantageously used, in combination with the other remedies, from the beginning; but their action becomes more a principle of treatment in the *second* and *third* stages, when *toxœmic* elements have accumulated in the system, and have to be eliminated. In modified pyrexial cases, their utility is strongly indicated, during the temporary reaction, when urea is accumulating in the blood, destroying the nervous irritability of the heart and brain, and encouraging the venous congestion of these organs. It is in cases of this kind that a timely and judiciously employed bleeding from the arm, may be of service in relieving the oppression of the heart and equalizing the circulation: but when resolved on, it should be performed while the patient is in the recumbent posture, and in the wet *cumlie*, or sheet, wrung out of scalding water. We may sometimes dispense with the use of the latter, particularly when there are symptoms of considerable tonicity in the circulation, and of local inflammatory action in any organ. Stephen Dewer's case (p. 19) was one of this kind, in which *gastro-intestinal* symptoms were predominant, accompanied by temporary abdominal spasms, pain at the epigastrium, and pulmonic oppression, head-ache, and irregular reaction; where the excitement of various organs, following previous congestion, might be viewed as a necessary condition of their restoration to health. In such cases, as in fever, we have to equalize the circulation by remedies that give tone to the nervous, and reduce phlogosis in the circulating system. The good effect of *general* and *local* bleeding will be manifest on reference to the report of the 4th of July, when relief from cramps, and diminution of pulse followed the former; and again, when on the 8th, complete removal of epigastric tenderness was produced by the latter. In the premonitory stage of the disease, where so much good can be effected by medicine, the removal of patients from low, damp, affected localities, to higher and drier situations, where they breathe a drier and purer air, will materially aid in effecting a cure: for whether it be the relatively altered electrical state of the air to the condition of the human body, that produces such beneficial results, the efficacy of the change, in such cases, is at *least* undoubted.

Judicious treatment of the two first stages of Cholera may avert, in most cases, the third one, of hopeless collapse; but, occasionally, the onset of the disease seems so deadly and rapid, the quantity of liquid ejected from the bowels so abundant, the vitality of the blood so completely gone, and the transition from healthy plumpness to withered old age so sudden, that all ordinary remedial measures prove abortive. In cases of such intensity, the serous exhalation from the alimentary mucous membrane is so excessive, that the absorption into the blood of medicines given by the mouth becomes impossible; and all remedies administered by such a channel, to rouse lost nervous energy, restore the pulse, and bring back animal heat, necessarily fail. The serosity exuding from the exhalent capillaries of the intestines and skin, or into the cellular tissue of serous cavities, leaves the blood in a thick, undecarbonized state, incapable of circulating through the blood-vessels. In this desperate extremity, injecting the veins with a saline solution, and the employment of *electro-magnetism*, in conjunction with camphor, sulphates of quinine and iron, diuretics, and sinapisms, to the abdomen, hold out the only chance left us of being able to continue the circulation, and rouse the paralyzed energies of the frame. I have never myself employed either the *saline injection* or *electro-magnetism;* but, on the testimony and faith of competent judges of their efficacy, I recommend them, in full confidence that they are the only remedies applicable to that state of complete collapse, when life is all but extinct. If it were possible that only one human being could be rescued from the jaws of death, by the use of the saline injection, still this small amount of success should stamp its usefulness, should encourage us in persevering, and incite us to further trials, and improved modes of application. The late Dr. McIntosh, of Edinburgh, recommends it in his *Practice of Physic;* Professor Lizars states, that he witnessed it performed, with great science and success, by Dr. Sibson, then an enthusiastic pupil of the Edinburgh School of Medicine;[1] and Dr. Marsden, of the Royal Free Hospital, cured eight collapsed patients in the year 1832, and partially restored fifteen more, who afterwards died of consecutive fever, at periods varying from four to twenty-one days.[2] Dr. Parkes having convinced himself that saline injections alone were not to be depended on, determined to try an alkaline solution of albumen, but was not successful in curing any of the five cases in which it was tried. All these cases were of the worst kind; yet the revivifying effects of the albuminous solution seemed well marked, and the return of animal heat became sometimes manifest. The operation is, he thinks, worthy of further trial, and is indeed harmless to patients otherwise doomed to death. Much of the want of success which attended the practice of saline injection of the veins in 1832, may be fairly ascribed to the use of it in too large quantity, or of too great alkaline strength. The patient must be carefully watched after the use of the injection; take quinine, opium, and astringents, to restrain any return of diarrhœa; abstain from all alcoholic stimulants; and be allowed nothing stronger than beef-tea, coffee, and arrow-root gruel.

Galvanism and electro-magnetism, in conjunction with other remedies, were beneficially used in India, by Dr. Parry, of H.M. 4th regiment, and by Dr. Chapman, of H.M. 63rd.[3] They appear to be good auxiliary remedies in the treatment of the severer forms of CHOLERA, and well deserve a more extensive trial in its second and third stages. One pole of the apparatus may be applied to an incision made over the region of the heart, and the other pole alternately to an incision over the eighth pair of nerves, on either side of the neck. The countenance became more animated, the lividity of the face and limbs in a great degree disappeared, the pulse became more distinct at the wrist, and the skin warmer; but sedulous and repeated application of the remedy, till the circulation be permanently restored, seems necessary, as its influence is not permanent.

Reaction, or the fulfilment of the fourth indication, must be treated on the principles applicable to varieties of fever. In thus endeavouring to introduce a rational system for the treatment of Cholera, on clear pathological principles, I have abstained from noticing the greater or less success of particular remedies, and the applicability of them to modifications of the disease; contenting myself by giving this brief outline of the treatment, on which I may probably enlarge, at some future time.

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[1] Investigations regarding CHOLERA ASPHYXIA in 1832. By Professor John Lizars, of Edinburgh, p. 74.

[2] Symptoms and Treatment of Cholera. By William Marsden, M.D., p. 53.

[3] Reports on Asiatic Cholera in Regiments of the Madras Army, from 1828-1844. By Samuel Rogers, Surgeon of the Madras Army, pp. 162 and 211.

Should the present attempt to abolish blind empiricism in the treatment of Cholera, and to introduce more definite ideas of the PATHOLOGY and CAUSES of the disease, as guides to better established THERAPEUTIC truths, be thought well of by the profession, the author hopes he may find opportunity, hereafter, for additional observations on this subject, and on the various medicines which deserve a preference, and are best worthy of confidence, in the several modifications of a malady which presents itself under so many different phases. If he has failed in his endeavour, it is not through ignorance of the maxim,—"vere scire est per causas scire."

27, Hyde Park Square, 17th August, 1849.

P.S. Since writing the above, I had an opportunity, (on the 22nd August), of seeing three cases of the disease, under the care of Dr. Cormack. One, an infant, was in a state of collapse, and died on the following day; another infant, in the same house, was passing into the same state, and died on the 25th. The third patient was an adult woman, who had been brought very low by the vomiting and purging. The symptoms on the day on which I saw her were precisely those of a pernicious ague: the danger of collapse seemed imminent; and there was almost total suppression of urine. She was judiciously treated by diuretics, stimulants, and a mixture of the citrate of iron and quinine. She is now convalescent. Dr. Cormack has sent me a very full account of the post-mortem appearances in the first fatal case; from which it appears that the deficiency of blood in every part of the body was most striking. The lungs were œdematous; the liver and kidneys pale; and the spleen was natural in size and consistence. The case has been since incorporated with the *anatomico-pathological* illustrations of these pages.

27th August.